DESIGN	FED.RD. DIV.NO.	PROJECT NO.			
CS	6	C 3427-3-7			
GRAPHICS	STATE	CONT	SECT	JOB	HIGHWAY NO.
CS	TEXAS	3427	03	007	FM 3356
CHECK	CHECK	DIST	COUNTY		SHEET NO.
MS	MS	DAL	COLLIN		1

FINAL PLANS

NAME OF CONTRACTOR: _____

DATE OF LETTING: _____

DATE WORK BEGAN: _____

DATE WORK COMPLETED: _____

DATE WORK ACCEPTED: _____

SUMMARY OF CHANGE ORDERS:

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

STATE PROJECT
C 3427-3-7
CSJ: 3427-03-007

FM 3356

COLLIN COUNTY

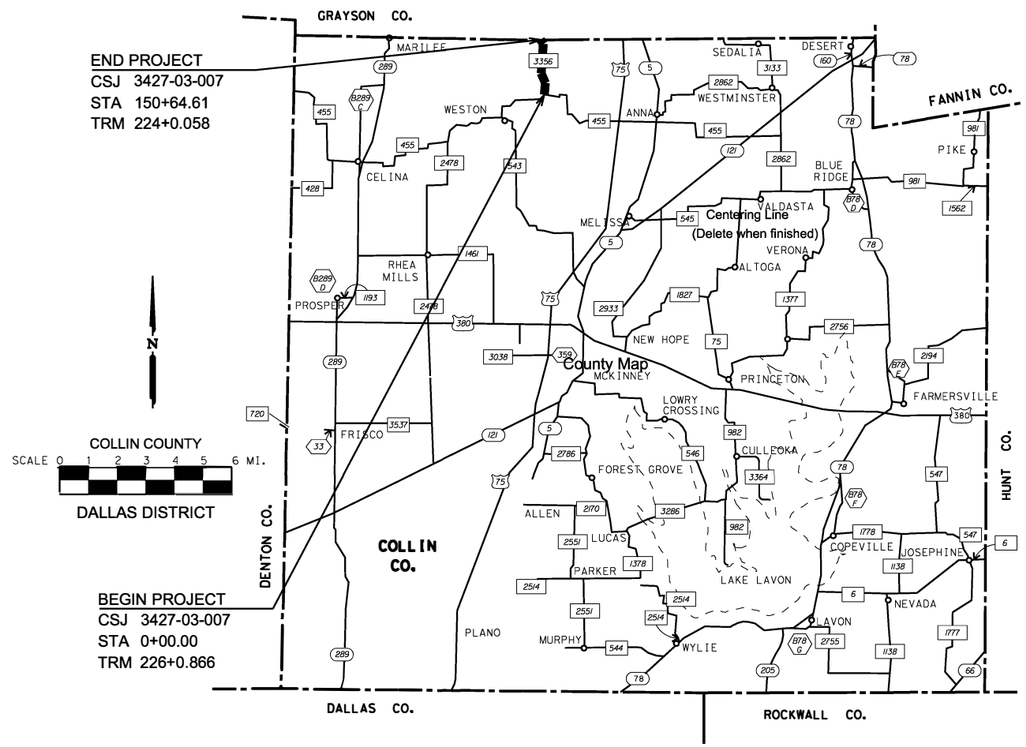
LIMITS: FROM FM 455
TO GRAYSON COUNTY LINE

TOTAL LENGTH OF PROJECT =

ROADWAY =	15064.61 FT. =	2.853	MI.
BRIDGE =	0.00 FT. =	0.000	MI.
TOTAL =	15064.61 FT. =	2.853	MI.

FOR THE CONSTRUCTION OF RESTORATION
CONSISTING OF RESTORE EXISTING PAVEMENT AND ADD SHOULDERS

END PROJECT
CSJ 3427-03-007
STA 150+64.61
TRM 224+0.058



BEGIN PROJECT
CSJ 3427-03-007
STA 0+00.00
TRM 226+0.866

EQUATIONS: NONE
EXCEPTIONS: NONE
RAILROAD CROSSINGS: NONE

DESIGN SPEED = 40 MPH
FUNCTIONAL CLASSIFICATION = RURAL MINOR COLLECTOR
ADT 1,000(2022)
1,400(2042)

NOTE:

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014, AND THE CONTRACT PROVISIONS LISTED AND DATED AS FOLLOWS SHALL GOVERN ON THIS PROJECT: SPECIAL LABOR PROVISIONS FOR STATE PROJECTS (000-008)

TEXAS DEPARTMENT OF TRANSPORTATION

SUBMITTED FOR LETTING
Docusigned by: 1/25/2023
Christopher Shirey , P.E.
CD9808925AAD473...
DESIGN ENGINEER

RECOMMENDED FOR LETTING
Docusigned by: 1/25/2023
James D. Campbell , P.E.
9867A...
DIRECTOR OF TRANSPORTATION PLANNING & DEVELOPMENT

RECOMMENDED FOR LETTING
Docusigned by: 1/25/2023
Jennifer Vorster , P.E.
4DB68ED93...
AREA ENGINEER

APPROVED FOR LETTING
Docusigned by: 1/25/2023
Cesson Clemens , P.E.
A879E0D...
DISTRICT ENGINEER

WORK WAS COMPLETED ACCORDING TO THE PLANS AND CONTRACT.

_____ , P.E.
Signature of Registrant & Date

DATE: _____

$USER$

$TIME$

$DATE$

SHEET NO.		DESCRIPTION
I. GENERAL		
1		TITLE SHEET
2		INDEX OF SHEETS
3		PROJECT LAYOUT AND ADVANCE WARNING SIGNS
4 - 5		TYPICAL SECTIONS
6		CORE DATA
7, 7A-7E		GENERAL NOTES
8, 8A-8B		ESTIMATE AND QUANTITY SHEET
9		ROADWAY QUANTITY SUMMARY
10		EARTHWORK QUANTITY SUMMARY
11		SW3P QUANTITY SUMMARY
12		DRAINAGE QUANTITY SUMMARY
13		DRIVEWAY QUANTITY SUMMARY
14		SIGN & PAVEMENT MARKING QUANTITY SUMMARY
15 - 17		SUMMARY OF SMALL SIGNS
II. TRAFFIC CONTROL PLAN		
18		TRAFFIC CONTROL PLAN SEQUENCE OF WORK & GENERAL NOTES
19		TCP TYPICAL SECTIONS
		TRAFFIC CONTROL PLAN STANDARDS
20 - 31	*	BC(1)-21 THROUGH BC(12)-21
32	*	TCP (2 - 1)-18
33	*	TCP (2 - 2)-18
34	*	TCP(3 - 1) -13
35	*	TCP (3 - 3)-14
36	*	TCP(7 - 1)-13
37	*	WZ(RS)-22
38	*	WZ(STPM)-13
39	*	WZ(UL)-13
40	*	TREATMENT FOR VARIOUS EDGE CONDITIONS
III. ROADWAY DETAILS		
41 - 42		HORIZONTAL ALIGNMENT DATA
43		VERTICAL ALIGNMENT DATA & SUPERELEVATION
44 - 50		ROADWAY PLANS
51 - 52		MISCELLANEOUS ROADWAY DETAILS
		ROADWAY STANDARDS
53	**	LJD(1-1)-07 (DAL)
54 - 57	*	MB(1)-21 TO MB(4)-21
58	*	RS(3)-13
59	*	RS(4)-13
60	*	TE (HMAC)-11
IV. RETAINING WALL DETAILS		
NONE		

SHEET NO.		DESCRIPTION
V. DRAINAGE DETAILS		
61		DRAINAGE AREA MAP
62 - 63		HYDROLOGIC AND HYDRAULIC CALCULATIONS
64 - 73		CULVERT LAYOUTS
		DRAINAGE STANDARDS
74	*	CH-PW-O
75	*	CH-PW-S
76	*	PAZD
77	*	PB
78	*	PDD
79	*	PSET-RP
80	*	PSET-RR
81	*	PSET-SP
82	*	SETP-PD
83 - 84	*	SRR
VI. UTILITIES		
NONE		
VII. BRIDGES		
NONE		
VIII. TRAFFIC ITEMS		
85 - 91		SIGNING & PAVEMENT MARKING LAYOUTS
92		GUIDE SIGN DETAILS
		TRAFFIC STANDARDS
93 - 95	*	TSR(3)-13 THRU TSR(5)-13
96	*	SMD (GEN)-08
97	**	SMD (SLIP-1)-08 (DAL)
98	*	SMD(SLIP-2)-08
99	*	SMD(SLIP-3)-08
100	*	PM (1)-20
101	*	PM (2)-20
102	*	PM (3)-20
103	*	D & OM(1)-20
104	*	D & OM(2)-20
105	*	D & OM(3)-20
106	*	D & OM(4)-20
107	*	D & OM(5)-20
108	**	2-LANE HIGHWAY CURVE SIGNING & MARKINGS (DAL)
IX. ENVIRONMENTAL ISSUES		
109 - 109A		STORMWATER POLLUTION PREVENTION PLAN
110		ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC) (DAL)
111 - 117		SW3P SITE MAP

SHEET NO.		DESCRIPTION
		ENVIRONMENTAL STANDARDS
118 - 120	*	EC (1)-16 THROUGH EC(3)-16
121 - 123	*	EC (9)-16
124	**	VEGETATION ESTABLISHMENT SHEET (DAL)
125	**	SW3P SIGN SHEET (DAL)

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER

Signature of Registrant , P.E. & Date 2/23/2023

* STATEWIDE STANDARDS
** DALLAS DISTRICT STANDARDS

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

Texas Department of Transportation

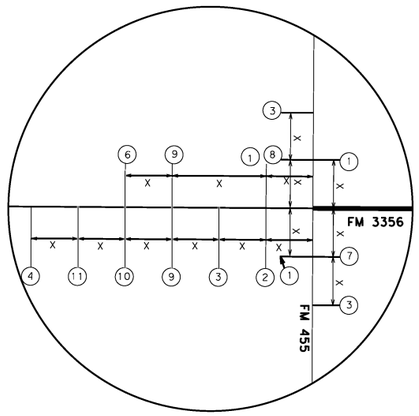
FM 3356
INDEX OF SHEETS

SHEET 1 OF 1

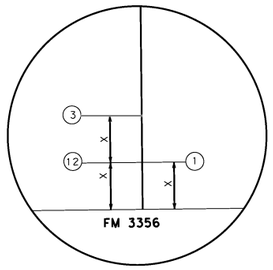
DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CS	TEXAS	DALLAS	COLLIN	
CHECK	CONTROL	SECTION	JOB	
MS	3427	03	007	02
CHECK				
JRV				

DATE TIME
DOCUMENT NAME
$FILEL$

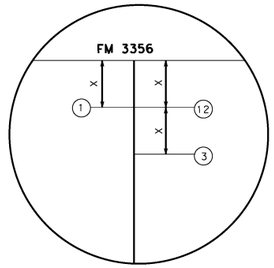
$PLTDRV$ PEN



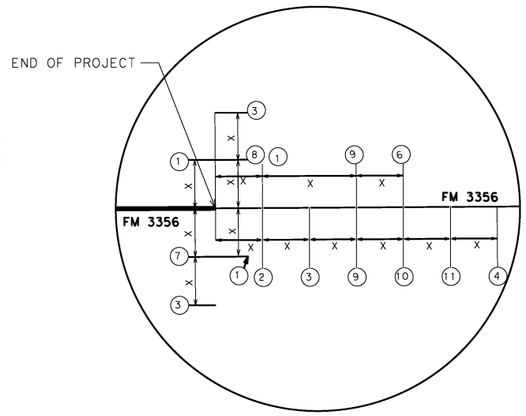
INTERSECTION A



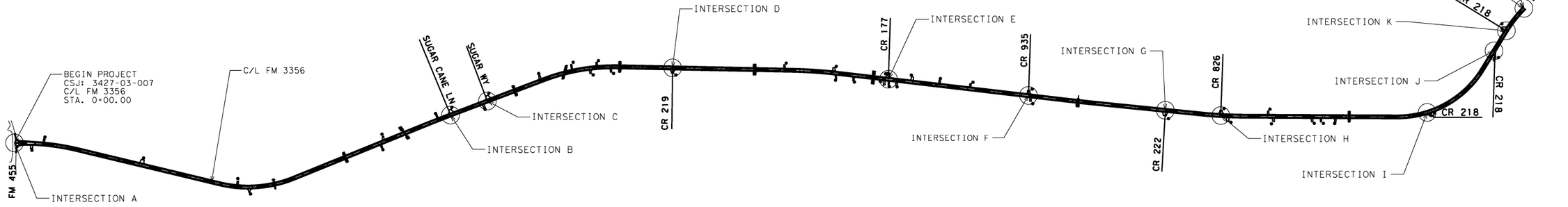
INTERSECTION B, C, D, G, H, I, K

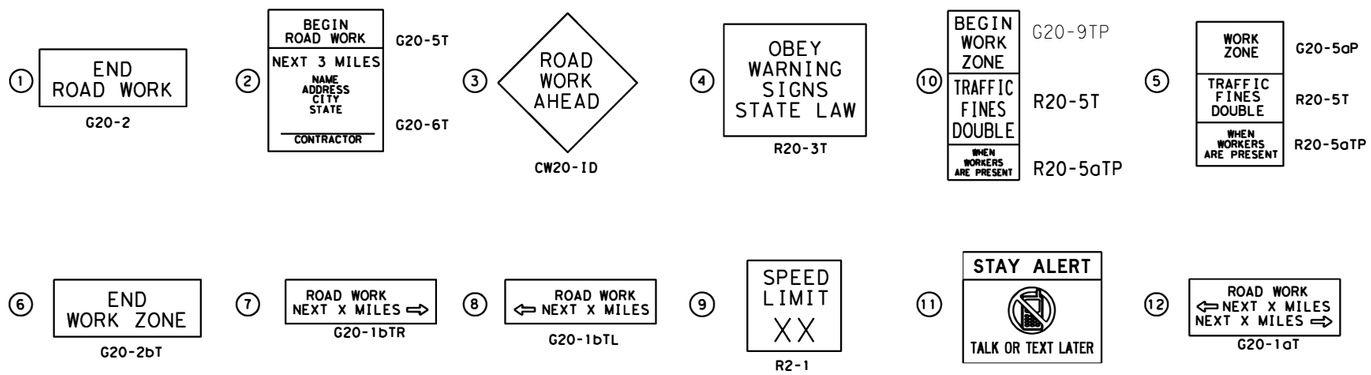


INTERSECTION E, F, J



INTERSECTION L





STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

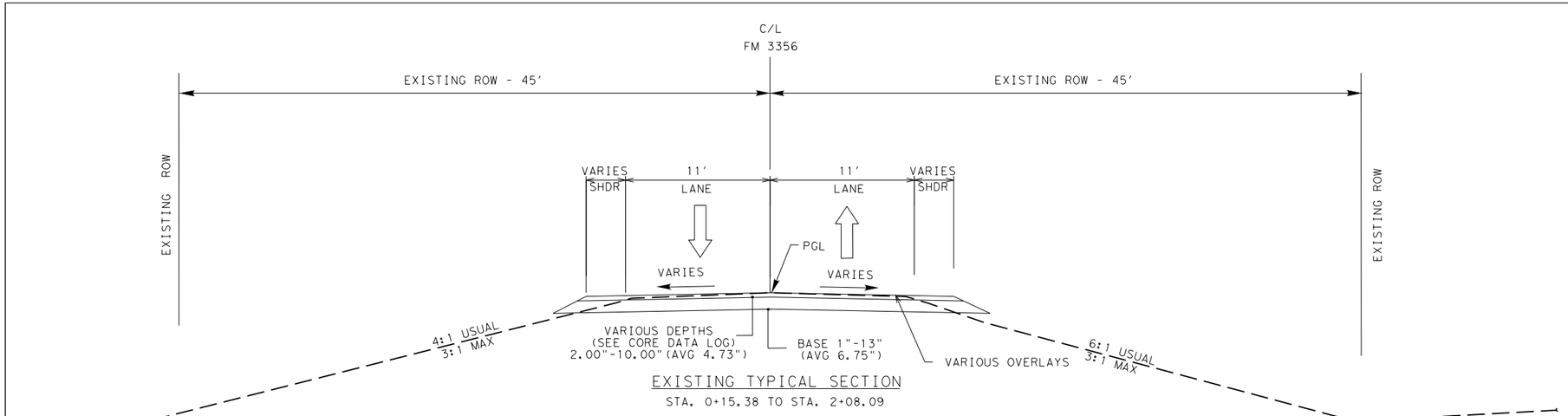
FM 3356
PROJECT LAYOUT AND ADVANCE WARNING SIGNS

N. T. S.

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CS	TEXAS	DALLAS	COLLIN	
CHECK	CONTROL	SECTION	JOB	
MS	3427	03	007	03
CHECK				
JRV				

$USER$ $TIME$ $DATE$ $FILEL$ $PLTDRV$ $PENS$



EXISTING TYPICAL SECTION

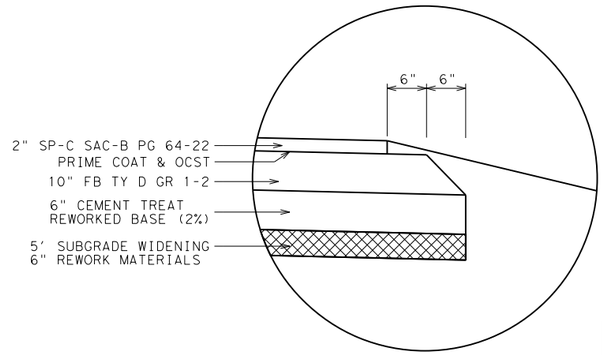
STA. 0+15.38 TO STA. 2+08.09

SEQUENCE OF CONSTRUCTION:

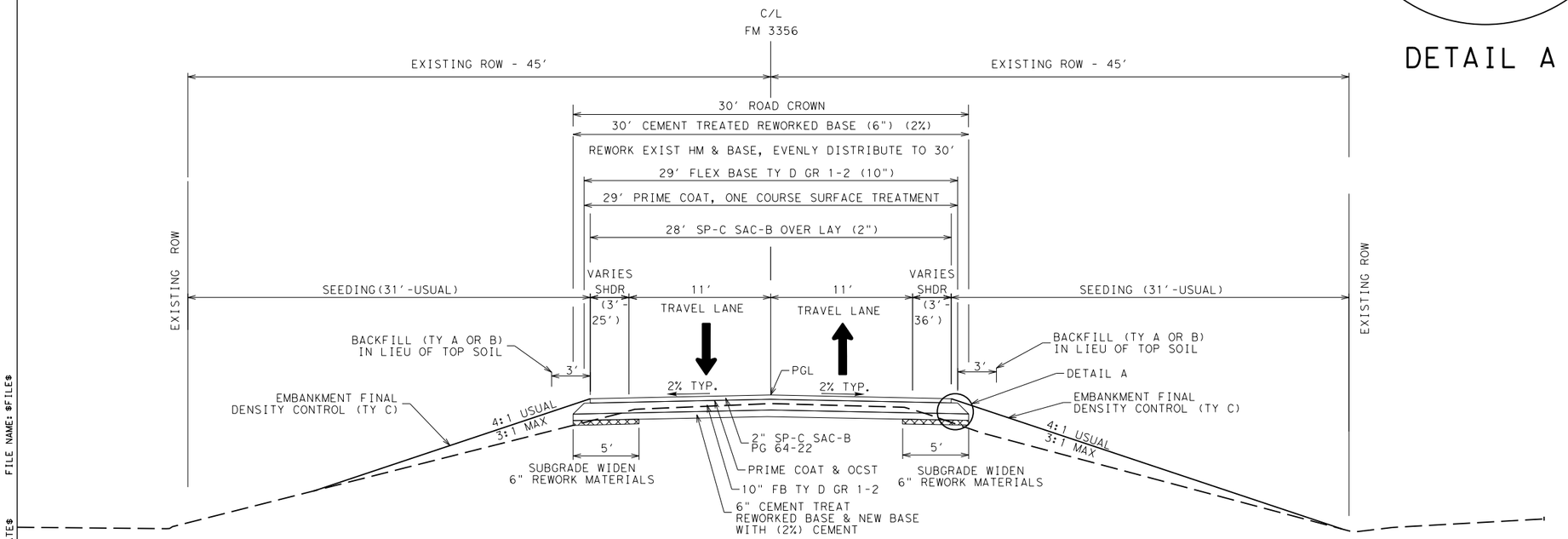
1. PREPARED SUBGRADE WIDENING PAID UNDER (ITEM 251)
2. REWORK 6" EXISTING MATERIAL (22′ WIDE)(ITEM 251), ADD 6" NEW FLBS(DEL)(247), SPREAD OVER 30′ SECTION 6" THICK, AND ADD 2% CEMENT (ITEM 275).
3. PLACE 10" NEW FLEXIBLE BASE OVER 30′ WIDTH (ITEM 247).
4. APPLY PRIME (ITEM 314) AND ONE-COURSE SURFACE TREATMENT (ITEM 316).
5. PLACE 2" HMAC SP-C SAC-B PG64-22 (ITEM 3077).

NOTE:

1. ADDITIONAL FLEX BASE (ROADWAY DELIVERY) AS NEEDED PAID FOR UNDER ITEM 247-6133(FL BS)(RDWY DEL)(TY D GR 1-2)
2. SUPERELEVATIONS ARE SHOWN IN PLANS.
3. HORIZONTAL & VERTICAL TRANSITIONS ARE SHOWN IN PLANS.
4. PGL WILL BE 8" HIGHER THAN EXISTING



DETAIL A



PROPOSED TYPICAL SECTION

STA. 0+15.38 TO STA. 2+08.09

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

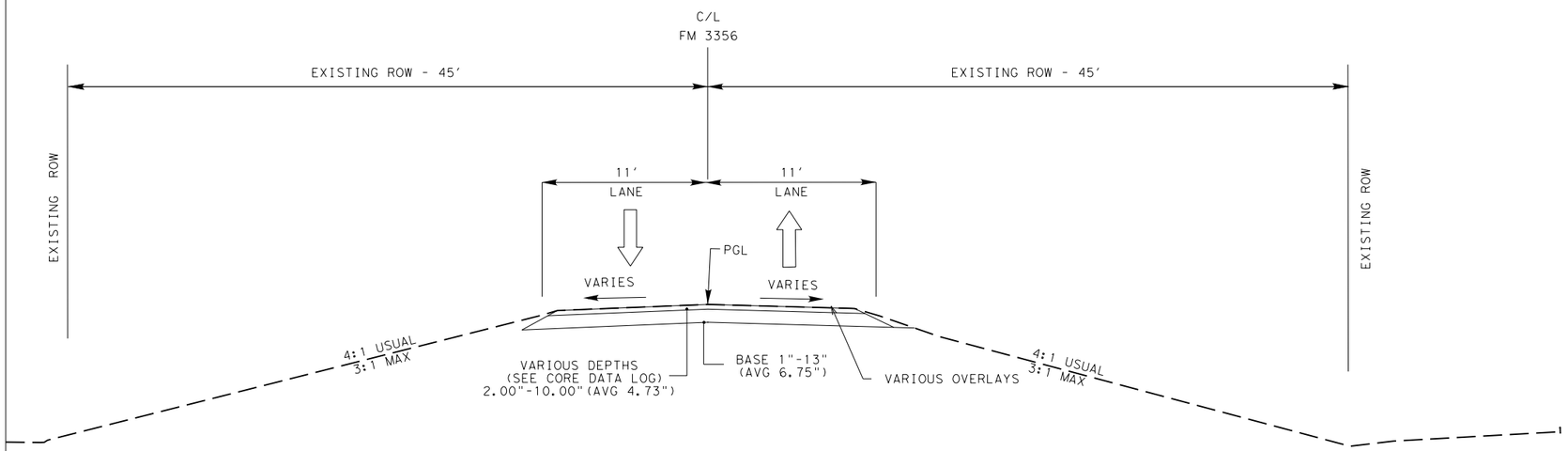
FM 3356 TYPICAL SECTIONS

SCALE: NTS

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CS	TEXAS	DALLAS	COLLIN	
CHECK	CONTROL	SECTION	JOB	
MS	3427	03	007	04
CHECK				
JRV				

FILE NAME: $FILE$

DATE: $DATE$



EXISTING TYPICAL SECTION

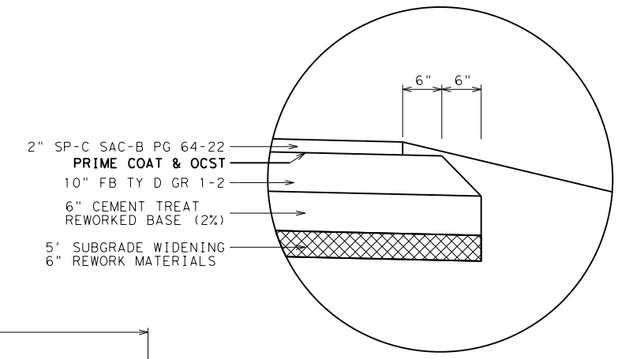
STA. 2+08.09 TO STA. 150+64.61

SEQUENCE OF CONSTRUCTION:

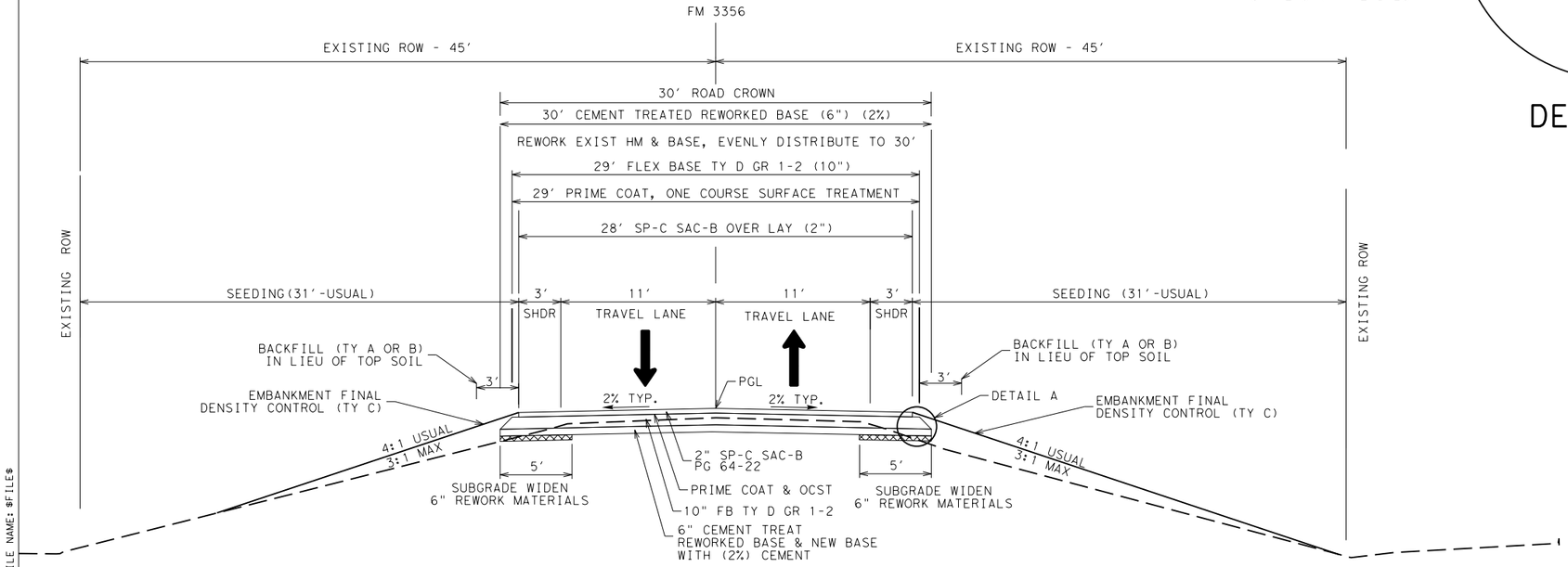
1. PREPARED SUBGRADE WIDENING PAID UNDER (ITEM 251)
2. REWORK 6" EXISTING MATERIAL (22′ WIDE)(ITEM 251), ADD 6" NEW FLBS(DEL)(247), SPREAD OVER 30′ SECTION, AND ADD 2% CEMENT (ITEM 275).
3. PLACE 10" NEW FLEXIBLE BASE OVER 30′ WIDTH (ITEM 247).
4. APPLY PRIME (ITEM 314) AND ONE-COURSE SURFACE TREATMENT (ITEM 316).
5. PLACE 2" HMAC SP-C SAC-B PG64-22 (ITEM 3077).

NOTE:

1. ADDITIONAL FLEX BASE (ROADWAY DELIVERY) AS NEEDED PAID FOR UNDER ITEM 247-6133(FL BS)(RDWY DEL)(TY D GR 1-2)
2. SUPERELEVATIONS ARE SHOWN IN PLANS.
3. HORIZONTAL & VERTICAL TRANSITIONS ARE SHOWN IN PLANS.
4. PGL WILL BE 8" HIGHER THAN EXISTING



DETAIL A



PROPOSED TYPICAL SECTION

STA. 2+08.09 TO STA. 150+64.61

FILE NAME: $FILE$

DATE: $DATE$

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER

02/03/2023

Texas Department of Transportation

FM 3356
TYPICAL SECTIONS

SCALE: NTS

SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	05
CHECK JRV	CONTROL	SECTION	JOB	
	3427	03	007	

BORING NO.	COORDINATES		TOTAL PAVEMENT THICKNESS (INCHES)	LAYER PROFILE (INCHES)	LAYER DESCRIPTION
	LATITUDE	LONGITUDE			
B-1	33.364032	-96.635864	4	4	ASPHALT
				7	BASE
				24	CLAY, TAN, FAT CLAY (CH)
B-2	33.368062	-96.634835	10.5	2	ASPHALT
				6	BASE
				84	CLAY, TAN, SANDY, LEAN CLAY (CL)
B-3	33.371796	-96.636303	7	2.25	ASPHALT
				11	BASE
				60	CLAY, GRAY, SANDY, LEAN CLAY (CL)
B-4	33.375842	-96.638098	2.5	2.5	ASPHALT
				8	BASE
				24	CLAY, GRAY, LEAN CLAY WITH SAND (CL)
B-5	33.379969	-96.638224	2.5	2.5	ASPHALT
				8	BASE
				24	CLAY, BROWN, FAT CLAY WITH SAND (CH)
B-6	33.3841	-96.637916	2.25	2.25	ASPHALT
				8.5	BASE
				48	CLAY, GRAY, FAT CLAY WITH SAND (CH)
B-7	33.388025	-96.637244	9	9	ASPHALT
				2	BASE
				24	CLAY, GRAY, FAT CLAY (CH)
B-8	33.392287	-96.63665	9.75	9.75	ASPHALT
				3	BASE
				24	CLAY, GRAY, FAT CLAY (CH)
B-9	33.396407	-96.636382	3	3	ASPHALT
				13	BASE
				60	CLAY, GRAY, FAT CLAY (CH)
B-10	33.400086	-96.637811	10	10	ASPHALT
				1	BASE
				48	CLAY, GRAY, FAT CLAY (CH)

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

FM 3356
CORE DATA

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS: CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK: MS	TEXAS	DALLAS	COLLIN	
CHECK: JRV	CONTROL	SECTION	JOB	06
	3427	03	007	

$USER$ $TIME$ $DATE$ $FILEL$ $PLTDRV$ PEN

SPECIFICATION DATA

Table 1: Soil Constants Requirements				
Item	Description	Plasticity Index		Note
		Max	Min	
132	EMBANKMENT (FINAL)(DENS CONT)(TY C)	40	8	1

Note 1: Material excavated from the project must meet the PI requirements when used in the top 10 feet of embankment that supports the pavement structure or other locations shown in the plans. Do not use shale and obtain approval to incorporate shaley clay produced by the construction project.

Table 2: Basis of Estimate for Permanent Construction					
Item	Description	Thickness	Rate		Quantity
164	Drill Seed (Perm) (R) (C)	N/A	See Specifications		119,609 SY
166 *	Fertilizer (12-6-6)	N/A	500	Lbs./Ac	6.4 Tons
168	Vegetative Watering (Warm)**	N/A	12	MG/Ac/Day	17,793 MG
314	Emuls Asph	N/A	0.20	Gal/SY	9,711 Gal
3077	SP MIXES	See Plans	110	Lbs./SY/In	5,691 Ton
*For contractor's information only **Use Summer rate for calculation, adjust for actual field conditions/temperatures as necessary. See Vegetation Establishment Plan Sheet for estimated daily rates.					
Note: (1) Base material weight based on 1.50 Ton/CY (dry- compacted) (2) Asphalt weight based on 110 Lbs./SY/In (3) Subgrade weight based on 1.5 Ton/CY (dry-compacted) (4) Item 314 Residual Asphalt 0.20 Gal/SY					

Table 3: Basis of Estimate for Temporary Erosion Control Items				
Item	Description	Rate		Quantity
164	Drill Seeding (Temp) (Warm or Cool)	See Specifications		119,609 SY
166*	Fertilizer (12-6-6)	500	Lb/Ac	6.4 Ton
168	Vegetative Watering (Warm)**	12	MG/Ac/Day	17,793 MG
*For Contractor's Information Only. **Use Summer rate for calculation, adjust for Actual Field Conditions/Temperatures as Necessary. See Vegetation Establishment Sheet for estimated daily rates.				

GENERAL

The construction, operation and maintenance of the proposed project will be consistent with the state implementation plan as prepared by the Texas Commission on Environmental Quality.

The disturbed area for this project, as shown on the plans is 25.48 acres. However, the Total Disturbed Area (TDA) will establish the required authorization for storm water discharges. The TDA of this project will be determined by the sum of the disturbed area in all project locations in the contract, and all disturbed area on all Project-Specific Locations (PSL) located in the project limits and/or within 1 mile of the project limits. The department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction site as shown on the plans, according to the TDA of the project. The contractor will obtain any required authorization from the TCEQ for the discharge of storm water from any PSL for construction support activities on or off of the project row according to the TDA of the project. When the TDA for the project exceeds 1 acre, provide a copy of the appropriate application of permit (NOI, or Construction Site Notice) to the engineer, for any PSL located in the project limits or within 1 mile of the project limits. Follow the directives and adhere to all requirements set forth in the TCEQ, Texas Pollution Discharge Elimination System, Construction General Permit (TPDES, CGP).

This project required permitting with environmental resources agencies, as outlined in the plan set Environmental Permits, Issues, and Commitments (EPIC) Sheet. There is a high probability that an environmentally sensitive area could be encountered on the contractor designated Project-Specific Locations (PSL) for this project (haul roads, equipment staging areas, borrow pits, disposal sites, field offices, storage areas, parking areas, etc.). Item 7.6 "Project-Specific Locations", provides a listing of regulatory agencies that may need to be contacted regarding this project.

Install traffic marking signs prior to sealcoat application and remove within three days after placement of traffic markings.

Leave all right of way areas undisturbed until actual construction is to be performed in said areas.

Contractor questions on this project are to be addressed to the following individual(s):

AE Name: Jennifer Vorster Email: Jennifer.Vorster@txdot.gov
AAE Name: Gerald Waltman Email: Gerald.Waltman@txdot.gov

Contractor questions will be accepted through email, phone, and in person by the above individuals.

Questions may be submitted via the Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following Address:

https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors
All contractor questions will be reviewed by the Engineer. All questions and any corresponding responses that are generated will be posted through the same Letting Pre-Bid Q&A web page.

The Letting Pre-Bid Q&A web page for each project can be accessed by using the dashboard to navigate to the project you are interested in by scrolling or filtering the dashboard using the controls on the left. Hover over the blue hyperlink for the project you want to view the Q&A for and click on the link in the window that pops up.

Paper copies of cross-sections may be produced by using the provided .pdf file located on the above FTP Website at the bidders' expense and at copying companies. This data is for non-construction purposes only and it is the responsibility of the prospective bidder to validate the enclosed data with appropriate plans, specifications and estimate for the project(s).

Item 5:
Underground utilities owned by the Texas Department of Transportation may be present within the Right-Of-Way on this project. For signal, illumination, surveillance, and communications & control maintained by TxDOT, call the TxDOT Traffic Signal Office (214-320-6682) for locates a minimum of 48 hours in advance of excavation. For irrigation systems, call TxDOT Landscape Office (214-320-6205) for locates a minimum of 48 hours in advance of excavation. If city or town owned irrigation facilities are present, call the appropriate department of the local city or town a minimum of 48 hours in advance of excavation. The Contractor is liable for all damages when utilities are damaged due to Contractor's negligence including, but not limited to, repair or replacement at the Contractor's expense.

For the project to be deemed complete, permanently stabilize all unpaved disturbed areas of the project with a vegetative cover at a minimum of 70% density for the control of erosion.

Place construction stakes/station markings at intervals of no more than 100 feet or as directed
by the Engineer. Place stakes and markings so as not to interfere with normal construction operations.

Item 6:
To comply with the latest provisions of Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, the contractor must submit a notarized original of the TxDOT Construction Material Buy America Certification Form for all items classified as construction materials. This form is not required for materials classified as a manufactured product.

Refer to the Buy America Material Classification Sheet for clarification on material categorization.

The Buy America Material Classification Sheet is located at the below link.
https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html for clarification on material categorization.

Item 7:
Repair or replace any structures and utilities that might have been damaged by negligence or a failure to have utility locates performed.

Perform all electrical work in accordance with the National Electrical Code and Texas Department of Transportation Specifications.

Consult with appropriate electric company representatives according to their respective area to coordinate electrical services installations.
Holiday restrictions – The Engineer may decide that no lane closures or construction operations shall be allowed during the restricted periods listed in the following holiday schedule. TxDOT has the right to lengthen, shorten, or otherwise modify these restricted periods as actual, or expected, traffic conditions may warrant. Working days will not be charged for these restricted periods. No additional compensation will be allowed for these closures (i.e., overhead, delays, stand-by, barricades or any other associated cost impacts).

- New Year's Eve and Day (5 am on December 31 thru 10:00 pm January 1)
- Easter Holiday weekend (5 am on Friday thru 10:00 pm Sunday)
- Memorial Day weekend (5 am on Friday thru 10:00pm Monday)
- Independence Day (5 am on July 3 thru 10:00 pm on July 5)
- Labor Day weekend (5 am on Friday thru 10:00 pm Monday)
- Thanksgiving Holiday (5 am on Wednesday thru 10:00 pm Sunday)
- Christmas Holiday (5 am on December 23 thru 10:00 pm December 26)

Item 8:
This Project will be a Standard Workweek.

The road-user cost liquidated damages are $792 per day.

Critical Path Method (CPM) schedule in P6 format will be required for this project. Submit baseline schedule and obtain approval prior to beginning construction. The Estimate will be held if monthly schedule update is not submitted.

Item 100:
Remove the existing roadway small signs, delineators and object markers as shown on the plans, or as directed, during construction within the right of way. Small sign, delineator and object marker removals are subsidiary to this Item.

Neatly Trim trees, overhanging branches and all underbrush at the ROW line to produce an 18" vertical clear area within the limits of ROW. This work is subsidiary to various bid items.

The limits of preparing right of way will be measured from Sta. 0+00.00 to Sta. 150+64.61 along the centerline of construction.

Item 104:
In those areas where the pavement is not to be overlaid, provide a smooth surface after the curb removal. Planing or grinding is considered an acceptable method at these locations. Measurement and payment is in accordance with this item.
Sawing of concrete is not paid for directly, but is considered subsidiary to this item.

Item 110:
Excavated shale is not an acceptable material for embankment.

Items 110 and 132:
Scarify and loosen the excavated areas, unpaved surface areas, except rock, to a depth of at least 8 inches and compact in accordance with the specifications.

Excavation and embankment for driveways, sleeper slabs, alleys and intersections will not be paid for directly, but will be considered subsidiary to these items.

Item 132:
Excavated material from the project site has not been determined to be suitable for embankment. The bidder assumes all risk for the use of excavated materials for embankment and is expected to meet all material requirements for embankment regardless of the source.

Perform Tex-106-E (Plasticity Index) by an approved laboratory on excavated soils from sources outside right of way when used in roadway embankment. Provide the test results at no expense to the department. The engineer will sample and test soils produced by the construction project for specification requirements or material sources specified in the plans.

Earth embankment Type C, is mainly composed of material other than shale. Furnish material that is free from vegetation or other objectionable material and that conforms to the requirements of Table 1 (Sheet A). If necessary, treat material with lime slurry in accordance with Item 260, “Lime Treatment (Road-Mixed)” in order to meet these requirements. Use Tex-121-E, figure 1, page 4 to calculate the amount of lime required. When lime treated subgrade is specified, 3000 PPM is the maximum allowed sulfate content in the top 3 feet when material comes from borrow source. Follow recommendations of 260.4.4 for mixing and mellowing. The engineer will test material placed or excavated to a depth of one foot below and laterally to one foot outside the proposed treatment limit. Lime treatment of this material will not be paid for directly, but will be considered subsidiary to this item.

Do not use shaley clays in embankment unless approved in writing.

Item 134:
Start backfilling pavement edges as soon as possible after the surface course is started.

Backfill and compact the pavement edges to produce a smooth surface adjacent to the pavement with no vertical edges.

Use Type “A” or “B” material to backfill pavement edges as shown in plans. Type “A” or “B” material shall consist of suitable material that when compacted will support the pavement edge. Rap is considered suitable Type “A” or “B” material.

Blade the existing vegetation into a neat wind-row prior to overlay. After placing Ty A or Ty B
backfill and placing seeding, the material from the wind-row shall be replaced on the completed slopes. Emulsion shall be placed at a 50/50 solution of water to emulsion

over disturbed area. Emulsion rate=0.15 Gal/SY residual. This work, materials and equipment shall be subsidiary to Item 134.

Item 247:
Construct uniform layer thickness of 12 inches, or less with the required density and moisture content. Minimum PI is equal to three (3) for all grades.

Item 251:
Saw existing asphalt along neat lines where portions are to be left in place temporarily or permanently. Sawing is not paid for directly, but is subsidiary to this item.

Item 301:
Provide liquid antistripping agents unless otherwise directed. Add the minimum dosage determined by the manufacturer or higher dosage determined by design requirement and try subsequent trials at 0.25% increments.

Item 314:
Apply MS-2 or SS-1 as a prime, dilute the asphalt with base finish water, distribute in successive applications, and work into the top 1/4” of flex base. Residual asphalt 0.20 Gal/SY.

Item 316:

	AC20-5TR, AC20-XP AC15-P	CRS-2P	RC-250
JANUARY			REQUIRES INTERMEDIATE COURSE TO BE PLACED
FEBRUARY			
MARCH		REFER TO STANDARD SPECIFICATIONS ITEM 316 FOR TEMPERATURE REQUIREMENTS	
APRIL			
MAY	REFER TO STANDARD SPECIFICATIONS ITEM 316 FOR TEMPERATURE REQUIREMENTS		
JUNE			
JULY			
AUGUST			
SEPTEMBER		REFER TO STANDARD SPECIFICATIONS ITEM 316 FOR TEMPERATURE REQUIREMENTS	
OCTOBER			
NOVEMBER			REQUIRES INTERMEDIATE COURSE TO BE PLACED
DECEMBER			

RC-250 is only allowed as a first course in accordance with table above.

Utilize an asphalt distributor capable of providing a transversely varied asphalt rate. The Engineer will select the pavements where the transversely varied asphalt rate is required.
When a transversely varied rate is required, the asphalt rate outside of the wheel paths will be between 22 and 32% higher than the asphalt rate applied in the wheel paths. Provide calibration documents to the Engineer that include a description of the spray bar(s) and nozzles that will be used and the percentage difference in asphalt rate achieved by each tested spray bar and nozzle arrangement. The nozzles proposed for use shall be clearly stamped or marked from the factory identifying the manufacturer.

First Course				
ITEM	APPLICATION			
	Emul. Asphalt Treatment	1st Course		
*Asphalt Type	MS-2 or SS-1	CRS-2P	AC20-5TR, AC20-XP, AC15-P	RC-250 #
*Asph. Rate (Gal/SY)	0.20	0.50	0.42	0.28
Aggregate Type		B or L	B or L	B or L
Aggregate Grade		3	3	5
Aggr. Rate (CY/SY)		1:105	1:105	1:125
Min. Cure Time	24 hrs	14 days (Emulsion)		

When RC-250 is used as the 1st course, an intermediate course will be required and will be placed as soon as temperature allows which will be before 2nd Course is placed.

Intermediate Seal	
ITEM	APPLICATION
	Intermediate Course
*Asphalt Type	CRS-2P
*Asph. Rate (Gal/SY)	0.44
Aggregate Type	B or L
Aggregate Grade	4
Aggr. Rate (CY/SY)	1:120

*The information above is intended to provide general guidance and as a basis of estimate. Based on the season and weather conditions at the time, the engineer will determine the asphalt type and rates to be used at the time of application.

In addition to the temperature requirements of this Item, AC Asphalts used in Surface Treatments and Sealcoats must be placed between May 15 and August 31. Emulsions may be substituted for AC Asphalts outside this timeframe only with the approval of the Engineer.

Item 320:
Use a self-propelled wheel mounted MTV capable of receiving mix from the haul trucks, separate from the paver. It shall have a minimum storage capacity of approximately 25 tons. It shall be equipped with a pivoting discharge conveyor and shall completely and thoroughly remix the material prior to placement. The effectiveness of the MTV's remixing ability is subject to the approval of the Engineer. In addition, the paver shall have a surge storage insert with a minimum capacity of 20 tons.

The use of windrow pick-up equipment is allowed except on the first course of roadway material placed over the subgrade.

Item 400:
Structural Excavation is not paid for directly but is considered subsidiary to pertinent Items.

When placing concrete storm drain pipe on slopes of greater than 10 percent, provide cement stabilized backfill to a depth shown on the plans.

Item 464:
The concrete collars and the connections of pipes to existing or proposed concrete boxes or pipe will not be paid for directly but will be considered subsidiary to the various bid items.

At locations where storm drains dead-end, plug with a concrete plug of a thickness equal to 1 ½ inches per foot of diameter of pipe with a minimum thickness of 3 inches. The cost of the plugs shall be included in the unit price bid per foot of the various storm drain pipes.

Item 465:
All manholes, junction boxes and inlets will require inverts unless otherwise directed.

Item 496:
Concrete pavement removed as a result of removing the inlets will not be paid for directly but will be considered as subsidiary to Item 496.

Inlet grates and manhole covers become the property of the contractor for disposal.

Salvage all existing inlet grates and manhole covers being removed.

Item 500:
Material On Hand (MOH) will not be used in calculating partial payments for Mobilization.

Item 502:
The Contractor Force Account "Safety Contingency" that has been established for this project is intended to be utilized for work zone enhancements, to improve the effectiveness of the Traffic Control Plan, that could not be foreseen in the project planning and design stage. These enhancements will be mutually agreed upon by the Engineer and the Contractor's Responsible Person based on weekly or more frequent traffic management reviews on the project. The Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

Access will be provided to all business and residences at all times. Where turning radii are limited during phased construction at intersections, provide all weather surfaces such as RAP or base in turning movements to accommodate and to protect the traffic from edge drop-offs. Materials, labor, maintenance and removal for these temporary accesses and radii will not be paid for directly but will be considered subsidiary to the various bid items.

Provide written proposed lane closure information by 1:00 pm on the business day prior to the proposed closures. Do not close lanes when this requirement is not met.

When excavation is required next to a pavement lane carrying traffic and the widening is not completed by the end of the work day, backfill against the edge of the pavement with at least a 3:1 slope using an acceptable material to support vehicular traffic. Carefully remove and dispose of this material when work resumes. Backfilling pavement edges, and the materials required for the work will be subsidiary to this item.

Place barricades and signs in locations that do not obstruct the sight distance of drivers entering the highway from driveways or side streets.

Do not commence work on the road before sunrise. Do not operate or park any equipment/machinery closer than 30 feet from the traveled roadway after sunset unless authorized by the engineer.

When moving unlicensed equipment on or across any pavement or public highways, protect the pavement from all damage using an acceptable method.

Limit lane closures along FM 3356 to the hours between 9:00 am and 3:30 pm. Work in other areas of the project is not restricted to this time frame.

Traffic Control Plans with Lane Closures causing back-ups of 8 minutes or greater in duration will be modified by the Engineer up to and including removal of the lane closure.

Additional lanes may be closed, started earlier, or extended later with written permission of the Engineer.

Item 506:
Take all practicable precautions to prevent debris from being discharged into the Waters of Texas or a designated wetland. Install Best Management Practices before demolition begins and maintain them during the demolition. Remove any debris or construction material that escapes containment devices and are discharged into the restricted areas, before the next rain event or within 24 hours of the discharge.

If temporary construction stream crossings are allowed under a Nationwide Permit, submit in writing for approval the type and location of each temporary stream crossing. Use temporary bridges, timber mats, or other structurally sound and non-eroding material for temporary stream crossings. A temporary culvert crossing will consist of storm sewer pipes and 4- to 8-inch nominal size rock. Temporary stream crossings must not cause more than minimal changes to the hydraulic flow characteristics of the stream, increase flooding, or cause more than minimal degradation of water quality. Remove the temporary stream crossings in their entirety and return the affected areas to

their pre-existing elevation. All work and materials use for temporary construction stream crossings will not be paid for directly but are subsidiary to pertinent Items.

Provide SW3P Signs. Obtain from the Engineer a copy of the project's completed TPDES Storm Water Program Construction Site Notice and Contractor Site Notice. Laminate the sheets and bond with adhesive to 36" X 36" plywood sign blanks. Ensure the sheets remain dry. Apply Type C Blue reflective sheeting as the background and add the text "SW3P" in 5" white lettering, centered at the top. Attach the signs to approved temporary mounts and locate at each of the project limits just inside the right of way line at a readable height or as directed by the Engineer. If the sign cannot be placed outside the clear zone, it must adhere to the TMUTCD. SW3P signs, maintenance, and reposting (for replacement or as needed to ensure readability) will be subsidiary to Item 502.

Concrete Washouts are required per the CGP. The Concrete Washout Area(s) structural controls must consist of temporary berms, temporary shallow pits, and/or temporary storage tanks to prevent contaminated runoff and must be lined as to prevent contamination of underlying soil. Ensure pits properly maintained including removal of concrete as not to allow over flow. The location(s) of washout area will be approved by the Engineer. When washout pits are no longer needed, they will be removed and area will be restored to original condition. This work, materials and labor will not be measured or paid for directly but will be subsidiary to Item 506, "Temporary Erosion, Sedimentation, and Environmental Controls."

Item 560:
Provide new mailbox with assembly. Cost will be subsidiary to this item.

Items 585:
Use Surface Test Type A on all intersections and driveways.

Use Surface Test Type B pay adjustment schedule 3 on the travel lanes.

Item 644:
Prior to taking elevations to determine lengths for fabrication of sign posts, obtain verification of all proposed locations.

All sign mounts shall have a clamp base system for all small roadside sign assemblies.

A 3 inch strip of red reflective sheeting shall be placed on all Do Not Enter sign assemblies. This sheeting shall be placed directly below the Do Not Enter sign for the entire length of the sign post facing wrong way traffic. This work will be considered subsidiary to Item 644.

Item 662 and 672:
Black adhesive will be used on asphalt pavements and white adhesive will be used on concrete pavements.

Item 3077:
Use aggregate that meets the Surface Aggregate Classification (SAC) requirement of Class B.

Provide PG binder 64-22 in Type SP-C mixture.

Item 6185:
The total number of truck mounted attenuators (TMAs) or trailer attenuators (TAs) required when utilizing the traffic control standards are shown in the tables below.

TCP 2 Series	Scenario	Required TMA/TA
(2-1)-18 / (2-2)-18	All	1

TCP 3 Series	Scenario			Required TMA/TA
(3-1)-13	All			2
(3-3)-14	A	B	D	2
	C			3

The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed for the project. Additional TMAs/TAs used that are not specified in the plans in which the contractor expects compensation will require prior approval from the Engineer.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 3427-03-007 **DISTRICT** Dallas **COUNTY** Collin
HIGHWAY FM 3356

			CONTROL SECTION JOB		**3427-03-007**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00066997**		
			COUNTY		**Collin**		
			HIGHWAY		**FM 3356**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	150.650		150.650	
	104-6009	REMOVING CONC (RIPRAP)	SY	8.000		8.000	
	110-6001	EXCAVATION (ROADWAY)	CY	14,798.000		14,798.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	17,499.000		17,499.000	
	134-6004	BACKFILL (TY A OR B)	STA	150.650		150.650	
	150-6001	BLADING	STA	150.650		150.650	
	164-6035	DRILL SEEDING (PERM) (RURAL) (CLAY)	SY	119,609.000		119,609.000	
	164-6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	119,609.000		119,609.000	
	168-6001	VEGETATIVE WATERING	MG	35,585.000		35,585.000	
	247-6133	FL BS (RDWY DEL) (TY D GR 1-2)	TON	11,083.000		11,083.000	
	247-6304	FL BS (CMP IN PLACE) (TY D GR 1-2)(10")	SY	48,679.000		48,679.000	
	251-6060	REWORK BS MTL (TY C)(12"-18")(ORD COMP)	SY	36,827.000		36,827.000	
	275-6001	CEMENT	TON	253.000		253.000	
	275-6004	CEMENT TREAT (MX EXST MTL & NW BS) (6")	SY	50,350.000		50,350.000	
	314-6021	EMULS ASPH (PRIME)(MS-2 OR SS-1)	GAL	9,711.000		9,711.000	
	316-6024	ASPH (CRS-2P)	GAL	8,114.000		8,114.000	
	316-6029	ASPH (RC-250)	GAL	4,545.000		4,545.000	
	316-6403	AGGR (TY-B GR-5 OR TY-L GR-5)	CY	132.000		132.000	
	316-6419	ASPH (AC-15P, AC-20-5TR OR AC-20XP)	GAL	6,817.000		6,817.000	
	316-6435	AGGR (TY-B GR-4 OR TY-L GR-4 SAC-B)	CY	415.000		415.000	
	316-6440	AGGR (TY-B GR-3 OR TY-L GR-3)(SAC-B)	CY	314.000		314.000	
	400-6005	CEM STABIL BKFL	CY	461.000		461.000	
	400-6008	CUT & RESTORE ASPH PAVING	SY	235.000		235.000	
	401-6001	FLOWABLE BACKFILL	CY	234.000		234.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	567.000		567.000	
	432-6031	RIPRAP (STONE PROTECTION)(12 IN)	CY	571.000		571.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	260.000		260.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	310.000		310.000	
	464-6009	RC PIPE (CL III)(42 IN)	LF	240.000		240.000	
	464-6010	RC PIPE (CL III)(48 IN)	LF	84.000		84.000	
	464-6017	RC PIPE (CL IV)(18 IN)	LF	1,052.000		1,052.000	
	464-6018	RC PIPE (CL IV)(24 IN)	LF	206.000		206.000	
	464-6020	RC PIPE (CL IV)(36 IN)	LF	26.000		26.000	
	465-6160	INLET(COMPL)(PAZD)(FG)(4FTX4FT-4FTX4FT)	EA	1.000		1.000	
	466-6097	HEADWALL (CH - PW - 0) (DIA= 24 IN)	EA	5.000		5.000	
	466-6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)	EA	6.000		6.000	
	466-6102	HEADWALL (CH - PW - 0) (DIA= 42 IN)	EA	3.000		3.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 3427-03-007 **DISTRICT** Dallas **COUNTY** Collin
HIGHWAY FM 3356

			CONTROL SECTION JOB		**3427-03-007**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00066997**		
			COUNTY		**Collin**		
			HIGHWAY		**FM 3356**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	466-6134	HEADWALL (CH - PW - S) (DIA= 36 IN)	EA	2.000		2.000	
	466-6136	HEADWALL (CH - PW - S) (DIA= 48 IN)	EA	2.000		2.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	62.000		62.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	8.000		8.000	
	467-6454	SET (TY II) (36 IN) (RCP) (6: 1) (P)	EA	2.000		2.000	
	496-6002	REMOV STR (INLET)	EA	5.000		5.000	
	496-6004	REMOV STR (SET)	EA	6.000		6.000	
	496-6006	REMOV STR (HEADWALL)	EA	14.000		14.000	
	496-6007	REMOV STR (PIPE)	LF	1,556.000		1,556.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	11.000		11.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	680.000		680.000	
	506-6003	ROCK FILTER DAMS (INSTALL) (TY 3)	LF	80.000		80.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	760.000		760.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	172.000		172.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	172.000		172.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	22,171.000		22,171.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	22,171.000		22,171.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	770.000		770.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	770.000		770.000	
	530-6005	DRIVEWAYS (ACP)	SY	3,645.000		3,645.000	
	533-6001	RUMBLE STRIPS (SHOULDER)	LF	28,264.000		28,264.000	
	533-6002	RUMBLE STRIPS (CENTERLINE)	LF	15,058.000		15,058.000	
	560-6011	MAILBOX INSTALL-S (TWW-POST) TY 4	EA	12.000		12.000	
	560-6012	MAILBOX INSTALL-D (TWW-POST) TY 4	EA	2.000		2.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	39.000		39.000	
	644-6002	IN SM RD SN SUP&AM TY10BWG(1)SA(P-BM)	EA	6.000		6.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	1.000		1.000	
	658-6099	INSTL OM ASSM (OM-2Z)(WFLX)GND	EA	40.000		40.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	30,130.000		30,130.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	1,507.000		1,507.000	
	666-6018	REFL PAV MRK TY I (W)6"(DOT)(100MIL)	LF	60.000		60.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	263.000		263.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	29,155.000		29,155.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	30,130.000		30,130.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	427.000		427.000	
	3077-6013	SP MIXESSP-CSAC-B PG64-22	TON	5,691.000		5,691.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 3427-03-007 **DISTRICT** Dallas **COUNTY** Collin
HIGHWAY FM 3356

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**3427-03-007**			
		PROJECT ID		**A00066997**			
		COUNTY		**Collin**			
		HIGHWAY		**FM 3356**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6185-6002	TMA (STATIONARY)	DAY	430.000		430.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	400.000		400.000	
	08	CONTRACTOR FORCE ACCOUNT EROSION CONTROL MAINTENANCE (NON-PARTICIPATING)	LS	1.000		1.000	
		CONTRACTOR FORCE ACCOUNT SAFETY CONTINGENCY (NON-PARTICIPATING)	LS	1.000		1.000	

$USER$

$TIME$

$DATE$

SUMMARY OF ROADWAY ITEMS

PLAN SHEET NO.	LOCATION	100 6002 PREPARING ROW	134 6004 BACKFILL (TY A OR B)	150 6001 BLADING	247 6133 FL BS (RDWY DEL) (TY D GR 1-2)	247 6304 FL BS (CMP IN PLACE) (TY D GR 1-2)(10")	251 6060 REWORK BS MTL (TY C)(12"-18")(ORD COMP)	275 6001 CEMENT	275 6004 CEMENT TREAT (MX EXST MTL & NW BS) (6")	314 6021 EMULS ASPH (PRIME)(MS -2 OR SS-1)	316 6024 ASPH (CRS-2P)	316 6029 ASPH (RC-250)	316 6403 AGGR (TY-B GR-5 OR TY-L GR-5)	316 6419 ASPH (AC-15P, AC-20-5TR OR AC-20XP)	316 6435 AGGR (TY-B GR-4 OR TY-L GR-4 SAC-B)	316 6440 AGGR (TY-B GR-3 OR TY-L GR-3)(SAC-B)
		STA	STA	STA	TON	SY	SY	TON	SY	GAL	GAL	GAL	CY	GAL	CY	CY
SHEET 1	BEGIN PROJECT TO STA. 24+00	24	24	24	1864	7867	5867	41	8134	1547	1312	735	21	1102	66	50
SHEET 2	STA. 24+00 TO STA. 48+00	24	24	24	886	7734	5867	40	8000	1547	1289	722	21	1083	66	50
SHEET 3	STA. 48+00 TO STA. 72+00	24	24	24	1895	7734	5867	40	8000	1547	1289	722	21	1083	66	50
SHEET 4	STA. 72+00 TO STA. 96+00	24	24	24	2689	7734	5867	40	8000	1547	1289	722	21	1083	66	50
SHEET 5	STA. 96+00 TO STA. 120+00	24	24	24	1895	7734	5867	40	8000	1547	1289	722	21	1083	66	50
SHEET 6	STA. 120+00 TO STA. 144+00	24	24	24	1833	7734	5867	40	8000	1547	1289	722	21	1083	66	50
SHEET 7	STA. 144+00 TO PROJECT END	6.65	6.65	6.65	21	2142	1625	12	2216	429	357	200	6	300	19	14
	PROJECT TOTALS	150.65	150.65	150.65	11083	48679	36827	253	50350	9711	8114	4545	132	6817	415	314

SUMMARY OF ROADWAY ITEMS (CONT'D)

PLAN SHEET NO.	LOCATION	533 6001 RUMBLE STRIPS (SHOULDER)	533 6002 RUMBLE STRIPS (CENTERLINE)	560 6011 MAILBOX INSTALL-S (TWW-POST) TY 4	560 6012 MAILBOX INSTALL-D (TWW-POST) TY 4	3077 6013 SP MIXES SP-C SAC-B PG64-22	6001 6002 PORTABLE CHANGEABLE MESSAGE SIGN	6185 6002 TMA (STATIONARY)	6185 6003 TMA (MOBILE OPERATION)
		LF	LF	EA	EA	TON	EA	DAY	HR
SHEET 1	BEGIN PROJECT TO STA. 24+00	4800	2400	2		920			
SHEET 2	STA. 24+00 TO STA. 48+00	4435	2400	1		904			
SHEET 3	STA. 48+00 TO STA. 72+00	4619	2400	1	1	904			
SHEET 4	STA. 72+00 TO STA. 96+00	4619	2400	6		904	2	430	168
SHEET 5	STA. 96+00 TO STA. 120+00	4064	2400	1	1	904			
SHEET 6	STA. 120+00 TO STA. 144+00	4627	2400	1		904			
SHEET 7	STA. 144+00 TO PROJECT END	1100	658			251			
	PROJECT TOTALS	28264	15058	12	2	5691	2	430	400

FM 3356
ROADWAY QUANTITY SUMMARY

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	09
	3427	03	007	

$FILE$ DATE TIME DOCUMENT NAME

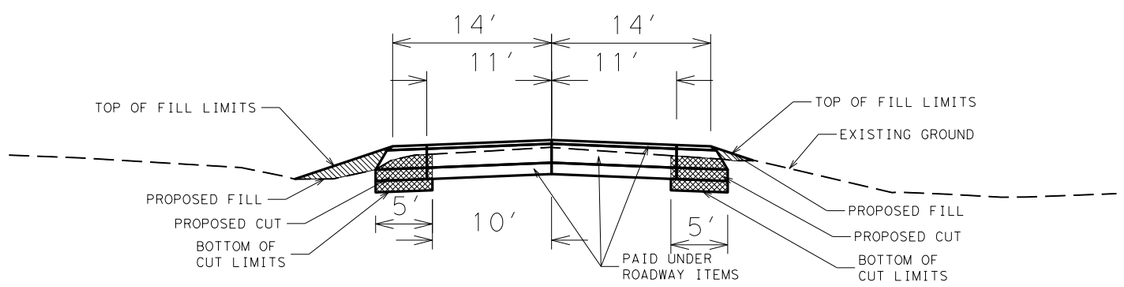
$PLTDRV$ PEN

STATION	110 6001 EXCAVATION (ROADWAY)	132 6006 EMBANKMENT (FINAL) (DENS CONT) (TY C)
1+00.0000	0	0
2+00.0000	128	62
3+00.0000	98	110.3
4+00.0000	98	165.1
5+00.0000	96	228.9
6+00.0000	88	203.9
7+00.0000	91	140.4
8+00.0000	99	89
9+00.0000	101	56.6
10+00.0000	103	50
11+00.0000	105	54.2
12+00.0000	104	45.2
13+00.0000	104	44.3
14+00.0000	102	72.5
15+00.0000	101	90.1
16+00.0000	102	86.5
17+00.0000	106	66.9
18+00.0000	106	51.9
19+00.0000	99	53.2
20+00.0000	98	86.7
21+00.0000	100	101.6
22+00.0000	97	78.4
23+00.0000	95	61.8
24+00.0000	91	137.1
25+00.0000	85	314.8
26+00.0000	89	293
27+00.0000	93	122.3
28+00.0000	93	50.6
29+00.0000	98	33.3
30+00.0000	95	52.3
31+00.0000	92	104.8
32+00.0000	89	135.3
33+00.0000	88	120.3
34+00.0000	93	80
35+00.0000	94	52.1
36+00.0000	96	65.2
37+00.0000	93	102.9
38+00.0000	84	242.6
39+00.0000	80	356.5
40+00.0000	82	286.4

STATION	110 6001 EXCAVATION (ROADWAY)	132 6006 EMBANKMENT (FINAL) (DENS CONT) (TY C)
41+00.0000	94	136.8
42+00.0000	102	53.4
43+00.0000	101	78.5
44+00.0000	104	109.8
45+00.0000	110	91.8
46+00.0000	114	47.8
47+00.0000	116	25.3
48+00.0000	110	119.5
49+00.0000	104	245
50+00.0000	102	237.3
51+00.0000	103	128.1
52+00.0000	102	48.9
53+00.0000	95	56.2
54+00.0000	92	155
55+00.0000	88	182.9
56+00.0000	84	134.2
57+00.0000	88	110.9
58+00.0000	93	85.4
59+00.0000	90	130.1
60+00.0000	79	263.8
61+00.0000	81	269.1
62+00.0000	89	177.9
63+00.0000	94	194.7
64+00.0000	103	136.4
65+00.0000	108	60.9
66+00.0000	102	91.3
67+00.0000	94	104.7
68+00.0000	100	66.9
69+00.0000	102	42.4
70+00.0000	101	55.9
71+00.0000	101	77
72+00.0000	103	90.2
73+00.0000	99	204.1
74+00.0000	88	259.3
75+00.0000	93	167.7
76+00.0000	93	115.6
77+00.0000	86	104
78+00.0000	91	99.2
79+00.0000	89	92.2
80+00.0000	85	86.1

STATION	110 6001 EXCAVATION (ROADWAY)	132 6006 EMBANKMENT (FINAL) (DENS CONT) (TY C)
81+00.0000	89	80
82+00.0000	95	54.5
83+00.0000	101	93.3
84+00.0000	94	229.4
85+00.0000	92	191.2
86+00.0000	97	99.8
87+00.0000	97	91.4
88+00.0000	97	72.2
89+00.0000	94	77
90+00.0000	97	62.1
91+00.0000	97	76.4
92+00.0000	87	100.5
93+00.0000	84	100.5
94+00.0000	94	92.9
95+00.0000	102	97.8
96+00.0000	95	106.2
97+00.0000	94	87.4
98+00.0000	100	71.3
99+00.0000	110	38.3
100+00.0000	106	42.8
101+00.0000	94	149.5
102+00.0000	88	247.9
103+00.0000	90	281.3
104+00.0000	91	364
105+00.0000	91	328.9
106+00.0000	89	206.8
107+00.0000	91	156.3
108+00.0000	113	94.6
109+00.0000	131	61.6
110+00.0000	131	57.8
111+00.0000	125	71.9
112+00.0000	125	68.8
113+00.0000	122	61.2
114+00.0000	121	60
115+00.0000	122	57.9
116+00.0000	114	78.6
117+00.0000	115	63.3
118+00.0000	107	75.9
119+00.0000	92	127.4
120+00.0000	104	120.4

STATION	110 6001 EXCAVATION (ROADWAY)	132 6006 EMBANKMENT (FINAL) (DENS CONT) (TY C)
121+00.0000	116	121
122+00.0000	121	114
123+00.0000	117	113
124+00.0000	102	139
125+00.0000	98	154
126+00.0000	94	177
127+00.0000	89	201
128+00.0000	93	158
129+00.0000	99	163
130+00.0000	97	206
131+00.0000	97	168
132+00.0000	97	129
133+00.0000	98	104
134+00.0000	89	120
135+00.0000	85	144
136+00.0000	89	119
137+00.0000	93	67
138+00.0000	96	53
139+00.0000	96	71
140+00.0000	97	79
141+00.0000	94	90
142+00.0000	92	100
143+00.0000	95	97
144+00.0000	97	86
145+00.0000	107	61
146+00.0000	114	41
147+00.0000	105	59
148+00.0000	100	59
149+00.0000	112	86
150+00.0000	136	104
150+57.5325	87	33
TOTAL	14798	17499



EARTHWORK CALCULATION DETAILS
N.T.S.

CONTRACTOR'S INFORMATION:

EARTHWORK QUANTITY CALCULATIONS WERE DONE USING MICROSTATION SOFTWARE

LEGEND:

EXCAVATION (CUT)

EMBANKMENT (FILL)

Texas Department of Transportation

FM 3356
EARTHWORK QUANTITY SUMMARY

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	10
	3427	03	007	

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DATE TIME
$FILE$ DOCUMENT NAME
$PLTDRV$
PEN

SUMMARY OF EROSION CONTROL ITEMS

PLAN SHEET NO.	LOCATION	164 6035 DRILL SEEDING (PERM) (RURAL) (CLAY)	164 6051 DRILL SEED (TEMP) (WARM OR COOL)	166 * FERTILIZER	168 6001 VEGETATIVE WATERING	506 6002 ROCK FILTER DAMS (INSTALL) (TY 2)	506 6003 ROCK FILTER DAMS (INSTALL) (TY 3)	506 6011 ROCK FILTER DAMS (REMOVE)	506 6020 CONSTRUCTION EXITS (INSTALL) (TY 1)	506 6024 CONSTRUCTION EXITS (REMOVE)	506 6038 TEMP SEDMT CONT FENCE (INSTALL)	506 6039 TEMP SEDMT CONT FENCE (REMOVE)	506 6041 BIODEG EROSN CONT LOGS (INSTL) (12")	506 6043 BIODEG EROSN CONT LOGS (REMOVE)
		SY	SY	TON	MG	LF	LF	LF	SY	SY	LF	LF	LF	LF
SHEET 1	BEGIN PROJECT TO STA. 24+00	19583	19583	2.2	5826				78	78	1199	1199	110	110
SHEET 2	STA. 24+00 TO STA. 48+00	19311	19311	2.0	5745	180		180			3466	3466	110	110
SHEET 3	STA. 48+00 TO STA. 72+00	19176	19176	2.0	5705	280		280			4504	4504	90	90
SHEET 4	STA. 72+00 TO STA. 96+00	18987	18987	2.0	5649	80	80	160			2998	2998	130	130
SHEET 5	STA. 96+00 TO STA. 120+00	18908	18908	2.0	5626	60		60			2326	2326	80	80
SHEET 6	STA. 120+00 TO STA. 144+00	18752	18752	2.0	5579	80		80			4371	4371	100	100
SHEET 7	STA. 144+00 TO PROJECT END	4892	4892	0.6	1455			0	78	78	1291	1291	80	80
	ADDITIONAL QUANTITY FOR REPLACEMENT DUE TO NORMAL WEAR OR CHANGING SITE CONDITIONS. QUANTITY INCREASED BY 10%								16	16	2016	2016	70	70
	PROJECT TOTALS	**119609**	**119609**	**12.8**	**35585**	**680**	**80**	**760**	**172**	**172**	**22171**	**22171**	**770**	**770**

* FOR CONTRACTOR'S INFORMATION ONLY

Texas Department of Transportation

FM 3356
SW3P QUANTITY SUMMARY

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	11
	3427	03	007	

SUMMARY OF DRAINAGE ITEMS														
LOCATION	104 6009	400 6005	400 6008	401 6001	402 6001	432 6031	464 6005	464 6008	464 6009	464 6010	465 6160	466 6097	466 6101	466 6102
	REMOVING CONC (RIPRAP)	CEM STABIL BKFL	CUT & RESTORE ASPH PAVING	FLOWABLE BACKFILL	TRENCH EXCAVATION PROTECTION	RIPRAP (STONE PROTECTION) (12 IN)	RC PIPE (CL III)(24 IN)	RC PIPE (CL III)(36 IN)	RC PIPE (CL III)(42 IN)	RC PIPE (CL III)(48 IN)	INLET(COMPL)(PAZD)(FG)(4FTX4FT-4FTX4FT)	HEADWALL (CH - PW - O) (DIA= 24 IN)	HEADWALL (CH - PW - O) (DIA= 36 IN)	HEADWALL (CH - PW - O) (DIA= 42 IN)
	SY	CY	SY	CY	LF	CY	LF	LF	LF	LF	EA	EA	EA	EA
CULVERT NO. 1 STA 25+12.55	1	36	14		76	9	80				1	1		
CULVERT No. 2 sta 32+32.76		23	14	27	54	57		60					2	
CULVERT No. 3 sta 38+38.84	2	58	22	67	96	44				84				
CULVERT No. 4 sta 49+59.64		43	14		37	56	60					2		
CULVERT No. 5 sta 54+59.64		34	21	57	75	77		70						
CULVERT No. 6 sta 59+90.62		43	18	29	59	57		60					2	
CULVERT No. 7 sta 72+68.64		67	35		45	71		120					2	
CULVERT No. 8 sta 83+98.64	2	37	34	54	59	106			120					2
CULVERT No. 9 sta 103+53.01		76	38		43	41			120					1
CULVERT No. 10 sta 129+31.79	3	44	25		23	53	120					2		
PROJECT TOTALS	**8**	**461**	**235**	**234**	**567**	**571**	**260**	**310**	**240**	**84**	**1**	**5**	**6**	**3**

SUMMARY OF DRAINAGE ITEMS					
LOCATION	466 6134	466 6136	496 6002	496 6006	496 * 6007
	HEADWALL (CH - PW - S) (DIA= 36 IN)	HEADWALL (CH - PW - S) (DIA= 48 IN)	REMOV STR (INLET)	REMOV STR (HEADWALL)	REMOV STR (PIPE)
	EA	EA	EA	EA	LF
CULVERT NO. 1 STA 25+12.55			1	1	78
CULVERT No. 2 sta 32+32.76			1	1	64
CULVERT No. 3 sta 38+38.84		2		2	89
CULVERT No. 4 sta 49+59.64				2	58
CULVERT No. 5 sta 54+59.64	2		1	1	76
CULVERT No. 6 sta 59+90.62			1	1	61
CULVERT No. 7 sta 72+68.64				2	104
CULVERT No. 8 sta 83+98.64			1	1	118
CULVERT No. 9 sta 103+53.01				1	88
CULVERT No. 10 sta 129+31.79				2	76
PROJECT TOTALS	**2**	**2**	**5**	**14**	**812**

* BID ITEM SHOWN ON MULTIPLE DISCIPLINES.

Texas Department of Transportation

FM 3356
DRAINAGE QUANTITY SUMMARY

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS: CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK: MS	TEXAS	DALLAS	COLLIN	
CHECK: JRV	CONTROL	SECTION	JOB	12
	3427	03	007	

SUMMARY OF DRIVEWAY ITEMS

DRIVEWAY NO.	PLAN SHEET NO.	EXISTING MATERIAL/TYPE	WIDTH	RADII	464 6017 RC PIPE (CL IV)(18 IN)	464 6018 RC PIPE (CL IV)(24 IN)	464 6020 RC PIPE (CL IV)(36 IN)	467 6363 SET (TY II) (18 IN) (RCP) (6: 1) (P)	467 6395 SET (TY II) (24 IN) (RCP) (6: 1) (P)	467 6454 SET (TY II) (36 IN) (RCP) (6: 1) (P)	496 6004 REMOV STR (SET)	496 * 6007 REMOV STR (PIPE)	530 6005 DRIVEWAYS (ACP)
			FT	FT	LF	LF	LF	EA	EA	EA	EA	LF	SY
1	1	DIRT DRIVEWAY	MATCH	15	30			2					85
2	1	ASPHALT DRIVEWAY	MATCH	MATCH	24			2				22	66
3	1	GRAVEL DRIVEWAY	MATCH	MATCH	50			2				42	146
4	1	DIRT DRIVEWAY	MATCH	MATCH	30			2				20	65
5	1	ASPHALT DRIVEWAY	MATCH	MATCH	32			2			2	44	88
6	2	GRAVEL DRIVEWAY	11	15	26			2				22	62
7	2	ASPHALT DRIVEWAY	MATCH	MATCH	30			2				22	71
8	2	ASPHALT DRIVEWAY	MATCH	MATCH	26			2				20	56
9	2	GRAVEL DRIVEWAY (SUGAR CANE LN)	11	15	44			2					149
10	2	GRAVEL DRIVEWAY	MATCH	15	28			2					68
11	2	GRAVEL DRIVEWAY (SUGAR WY)	11	15	66			2					149
12	3	GRAVEL DRIVEWAY	MATCH	15	34			2				26	71
13	3	DIRT DRIVEWAY	MATCH	MATCH									74
14	3	GRAVEL DRIVEWAY	MATCH	MATCH	26			2				22	69
15	3	GRAVEL DRIVEWAY	MATCH	MATCH	26			2				22	58
16	3	DIRT DRIVEWAY	11	15	26			2					61
17	3	ASPHALT DRIVEWAY (CR 219)	MATCH	MATCH	50			2			2	40	130
18	4	ASPHALT DRIVEWAY	MATCH	MATCH	24			2					59
19	4	GRAVEL DRIVEWAY	11	15									13
20	4	DIRT DRIVEWAY	MATCH	MATCH	22			2				20	53
21	4	GRAVEL DRIVEWAY	MATCH	MATCH	28			2					64
22	4	ASPHALT DRIVEWAY (CR 177)	MATCH	MATCH	50			2				43	158
23	4	GRAVEL DRIVEWAY	MATCH	MATCH		72			2			31	91
24	4	ASPHALT DRIVEWAY	MATCH	MATCH		72			2			56	60
25	4	DIRT DRIVEWAY	11	15			26			2		15	74
26	4	DIRT DRIVEWAY	11	15		34			2			25	92
27	4	ASPHALT DRIVEWAY	MATCH	15		28			2			23	59
28	4	GRAVEL DRIVEWAY	MATCH	15	28			2				24	59
29	5	ASPHALT DRIVEWAY (CR 935)	MATCH	15	44			2				30	114
30	5	GRAVEL DRIVEWAY	MATCH	MATCH	28			2				20	67
31	5	ASPHALT DRIVEWAY (CR 222)	11	15	56			2					166
32	5	GRAVEL DRIVEWAY	MATCH	15									132
33	5	ASPHALT DRIVEWAY (CR 826)	11	15	36			2					106
34	6	GRAVEL DRIVEWAY	MATCH	15	28			2				20	59
35	6	GRAVEL DRIVEWAY	MATCH	MATCH	30			2				33	56
36	6	GRAVEL DRIVEWAY	MATCH	MATCH	30			2				33	72
37	6	GRAVEL DRIVEWAY	MATCH	MATCH	32			2			2	33	74
38	6	GRAVEL DRIVEWAY	MATCH	MATCH	26			2					53
39	6	ASPHALT DRIVEWAY (CR 218)	MATCH	MATCH	42			2				36	128
40	7	ASPHALT DRIVEWAY (CR 218)	11	15									185
41	7	APHALT DRIVEWAY (CR 218)	11	15									184
PROJECT TOTAL					1052	206	26	62	8	2	6	744	3645

* BID ITEM SHOWN ON MULTIPLE DISCIPLINES.

NOTES:

1. MATCH EXISTING DRIVEWAY WIDTH WITH A MINIMUM OF 11'.
2. MATCH EXISTING DRIVEWAY RADIUS WITH A MINIMUM OF 15'.
3. MATCH EXISTING DRIVEWAY RADIUS (CROSS STREETS) WITH A MINIMUM OF 30'.
4. SEE "PLAN SHEET" AND MISCELLANEOUS ROADWAY DETAILS" SHEET FOR DRIVEWAY AND DRIVEWAY PIPE LOCATIONS AND DETAILS.
5. REMOVAL OF ASPHALT DRIVEWAYS IS SUBSIDIARY TO ITEM 530.
NO ADDITIONAL COST FOR CUTTING PIPE AT DRIVEWAY CROSSING.

DATE TIME
DOCUMENT NAME

Texas Department of Transportation

FM 3356
DRIVEWAY QUANTITY SUMMARY

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	13
	3427	03	007	

$USER$

$TIME$

$DATE$

SUMMARY OF PAVEMENT MARKING ITEMS

PLAN SHEET NO.	LOCATION	662 6034	662 6111	666 6018	666 6048	666 6303	666 6315	672 6009
		WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	REFL PAV MRK TY I (W)6"(DOT)(100MIL)	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	REFL PAV MRKR TY II-A-A
		LF	EA	LF	LF	LF	LF	EA
SHEET 1	BEGIN PROJECT TO STA. 24+00	4800	240			4800	4800	60
SHEET 2	STA. 24+00 TO STA. 48+00	4800	240		57	4635	4800	60
SHEET 3	STA. 48+00 TO STA. 72+00	4800	240		26	4719	4800	60
SHEET 4	STA. 72+00 TO STA. 96+00	4800	240		26	4596	4800	60
SHEET 5	STA. 96+00 TO STA. 120+00	4800	240		73	4564	4800	60
SHEET 6	STA. 120+00 TO STA. 144+00	4800	240	24	14	4727	4800	60
SHEET 7	STA. 144+00 TO PROJECT END	1330	67	36	67	1114	1330	67
	PROJECT TOTALS	30130	1507	60	263	29155	30130	427

SUMMARY OF SIGNING ITEMS

PLAN SHEET NO.	LOCATION	644 6001	644 6002	644 6004	658 6099
		IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM TY10BWG(1)SA(P-BM)	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	INSTL OM ASSM (OM-2Z)(WFLX)GND
		EA	EA	EA	EA
SHEET 1	BEGIN PROJECT TO STA. 24+00	10	1	1	
SHEET 2	STA. 24+00 TO STA. 48+00	8			12
SHEET 3	STA. 48+00 TO STA. 72+00	9	1		12
SHEET 4	STA. 72+00 TO STA. 96+00		1		8
SHEET 5	STA. 96+00 TO STA. 120+00		3		4
SHEET 6	STA. 120+00 TO STA. 144+00	8			4
SHEET 7	STA. 144+00 TO PROJECT END	4			
	PROJECT TOTALS	39	6	1	40

FM 3356
SIGN & PAVEMENT MARKING QUANTITY SUMMARY

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	14
	3427	03	007	

DATE TIME
$FILE$ DOCUMENT NAME

$PLTDRV$ PEN

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE: FRP = Fiberglass, TWT = Thin-Wall, 10BWG = 10 BWG, S80 = Sch 80	POSTS: 1 or 2	ANCHOR TYPE: UA=Universal Conc, UB=Universal Bolt, SA=Slipbase-Conc, SB=Slipbase-Bolt, WS=Wedge Steel, WP=Wedge Plastic	MOUNTING DESIGNATION: PREFABRICATED P = "Plain", T = "T", U = "U"	MOUNTING DESIGNATION: 1EXT or 2EXT = # of Ext, BM = Extruded Wind Beam, WC = 1.12 #/ft Wing Channel, EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE: TY N, TY S
1	1	R1-1	STOP	36 x 36	X		10BWG	1	SA	P	BM	
	2	D1-2	(DESTINATION - 2 LINE)	72 x 30	X		10BWG	1	SA	T		
	3	W3-1	SYMBOL - STOP AHEAD	36 x 36	X		10BWG	1	SA	P		
	4	M3-1	NORTH <AUXILIARY SIGN>	24 x 12	X		10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X							
	5	R12-1T	WEIGHT LIMIT/GROSS (WEIGHT) LBS	24 x 36	X		10BWG	1	SA	P		
	6	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		
	7	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X		10BWG	1	SA	P		
		M2-1	JCT <AUXILIARY SIGN>	21 x 15	X							
	8	W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X		10BWG	1	SA	P		
		W1-2L	SYMBOL - HORIZ CURVE LEFT	36 x 36	X							
	9	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
	10	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
	11	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
	12	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
2	1	W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X		10BWG	1	SA	P		
		W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X							
	2	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
	3	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
	4	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
	5	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
	6	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
	7	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X		10BWG	1	SA	P		
		M3-1	NORTH <AUXILIARY SIGN>	24 x 12	X							
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
	8	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
3	1	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
	2	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

* Sign to remain.

** Salvage signs and reinstall on the new post.

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 1 OF 3

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
4-16	DIST	COUNTY		SHEET NO.
8-16	DAL	Collin		15

18

DATE: 2023/01/17
FILE: DOCUMENT NAME

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE: FRP = Fiberglass, TWT = Thin-Wall, 10BWG = 10 BWG, S80 = Sch 80	POSTS: 1 or 2	ANCHOR TYPE: UA=Universal Conc, UB=Universal Bolt, SA=Slipbase-Conc, SB=Slipbase-Bolt, WS=Wedge Steel, WP=Wedge Plastic	MOUNTING DESIGNATION: PREFABRICATED: P = "Plain", T = "T", U = "U"	MOUNTING DESIGNATION: 1EXT or 2EXT = # of Ext, BM = Extruded Wind Beam, WC = 1.12 #/ft Wing Channel, EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE: TY N, TY S
3	3	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30								
	4	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30								
	5	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30								
	6	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30								
	7	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30								
	8	W1-2L	SYMBOL - HORIZ CURVE LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18								
	9	W14-2	NO OUTLET	36 x 36	X		10BWG	1	SA	P		
	10	R1-1	STOP	36 x 36	X		10BWG	1	SA	P	BM	
**		D3-1	(STREET NAME)	VAR X VAR								
4	1	R1-1	STOP	36 x 36	X		10BWG	1	SA	P	BM	
**		D3-1	(STREET NAME)	VAR X VAR								
5	1	R1-1	STOP	36 x 36	X		10BWG	1	SA	P	BM	
**		D3-1	(STREET NAME)	VAR X VAR								
	2	R1-1	STOP	36 x 36	X		10BWG	1	SA	P	BM	
**		D3-1	(STREET NAME)	VAR X VAR								
	3	R1-1	STOP	36 x 36	X		10BWG	1	SA	P	BM	
**		D3-1	(STREET NAME)	VAR X VAR								
6	1	W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X		10BWG	1	SA	P		
		W1-4L	SYMBOL - REVERSE CURVE LEFT									
	2	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>		X							
	3	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
	4	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
	5	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
	6	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
	7	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
	8	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
7	1	R12-1T	WEIGHT LIMIT/GROSS (WEIGHT) LBS	24 x 36	X		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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NOTE:

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3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

* Sign to remain.

** Salvage signs and reinstall on the new post.

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 2 OF 3

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
4-16 8-16	DIST	COUNTY		SHEET NO.
	DAL	Collin		16

18

DATE: 2022/11/28
FILE: DOCUMENT NAME

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
7	2	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X		10BWG	1	SA	P		
		M3-3	SOUTH <AUXILIARY SIGN>	24 x 12	X							
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
	3	I-2AT	(CITY NAME) CITY LIMIT	66X24	X		10BWG	1	SA	P		
	4	I-2AT	(CITY NAME) CITY LIMIT	48X24	X		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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NOTE:

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* Sign to remain.

** Salvage signs and reinstall on the new post.

DATE: 2022/11/28
FILE: DOCUMENT NAME

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 3 OF 3

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		3427	03	007	FM 3356
4-16		DIST	COUNTY		SHEET NO.
8-16		DAL	Collin		17

GENERAL SEQUENCE OF WORK:

1.) ERECT PROJECT LIMIT AND ADVANCE WARNING SIGNS AS SHOWN IN THE THE PLANS, BC, TCP, AND WZ STANDARDS AND AS DIRECTED BY THE ENGINEER.

2.) PLACE AND MAINTAIN SW3P DEVICES AS SHOWN IN THE PLANS AND AS DIRECTED BY THE ENGINEER. TEMPORARY SW3P EROSION CONTROL MEASURES SHALL ONLY BE PLACED IN AREAS WHERE SOIL DISTURBANCE OR OTHER POTENTIAL POLLUTANT-GENERATING ACTIVITIES ARE EXPECTED TO OCCUR WITHIN TWO WEEKS.

3.) USING DAILY LANE CLOSURES, CUT/RESTORE CULVERT REPLACEMENTS. BLADE EDGES.

4.) BLADE THE TOPSOIL OFF THE SLOPE, SALVAGE/WINDROW OUT OF THE WAY OF WORK.
PLACE SW3P CONTROL MEASURES AT STOCKPILE AS APPROPRIATE TO PROTECT SOIL QUALITY AND PREVENT SEDIMENTATION OF DOWNSLOPE PERIMETER, ROADWAYS, CULVERTS AND WATERWAYS.

5.) NOTCH DOWN BESIDE EXISTING PAVEMENT AND CONSTRUCT SUBGRADE WIDENING.

6.) REWORK HALF MILE SEGMENT OF ROADWAY FOR THE FULL WIDTH OF ROADWAY.

7.) SHAPE REWORK MATERIALS TO 30' WIDTH INCLUDING 5' SUBGRADE WIDENING.
CEMENT TREAT 6" REWORK MATERIAL AT 2%.

8.) PLACE 10" OF NEW FLEXIBLE BASE MATERIAL OVER CEMENT TREATED SUBGRADE ACROSS THE ENTIRE WIDTH OF THE SECTION.
SEQUENCE OPERATIONS TO CONSTRUCT FULL WIDTH BASE SECTION WHERE NO GRADE DIFFERENCE IS PRESENT AT CENTERLINE AT COMPLETION OF DAILY OPERATIONS. TRANSITION TRAFFIC DAILY AS SHOWN IN STEP 6 OF THE TCP TYPICAL SECTIONS.

9.) PRIME THE NEW FLEX BASE, PLACE ONE COURSE SURFACE TREATMENT (OCST), INSTALL NONREMOVABLE WORK ZONE MARKINGS AND PROCEED TO THE NEXT HALF MILE SEGMENT OF ROADWAY.
(REPEAT STEPS 4-9)

10.) CONSTRUCT DRIVEWAYS AND DRIVEWAY DRAINAGE STRUCTURES THE SAME CONSTRUCTION PHASE OR OPERATION AS ADJACENT ROADWAY PAVEMENT.

11.) WHEN 1.5 MILES OF OCST IS IN PLACE, CONSTRUCT 2" SUPERPAVE SP-C OVERLAY

12.) REPEAT STEPS 4 THROUGH 11, FOR THE REMAINING SEGMENTS.

13.) BACKFILL/EMBANK EDGES AND GRADE TO DRAIN IN ACCORDANCE WITH CROSS-SECTIONS AND THE EXISTING TOPOGRAPHY; PULL TOPSOIL BACK UP THE SLOPE.

14.) ERECT PERMANENT SIGNS AND PLACE PERMANENT PAVEMENT MARKINGS.

15.) ESTABLISH PERMANENT VEGETATIVE COVER.

16.) TEMPORARY SW3P EROSION CONTROL MEASURES SHALL BE REMOVED WITHIN TWO WEEKS OF VEGETATION ESTABLISHMENT IN THEIR CONTROL AREA, OR AS APPROVED BY THE ENGINEER.

17.) PERFORM FINAL SITE CLEAN UP AS DIRECTED BY THE ENGINEER AND REMOVE PROJECT LIMIT/ADVANCE WARNING SIGNS.

TCP GENERAL NOTES:

1.) BOTH LANES MUST BE OPEN TO TRAFFIC AT THE END OF EACH WORK DAY. ANY TRANSITIONS BETWEEN EXISTING AND PROPOSED GRADES MUST BE 25:1 OR LESS.

2.) INTERMITTENT ONE-WAY TRAFFIC CONTROL (LANE CLOSURES) WILL BE IN ACCORDANCE WITH THE TCP STANDARDS AND AS DIRECTED BY THE ENGINEER.

3.) OVERNIGHT LANE CLOSURES WILL NOT BE PERMITTED.

4.) THE CONTRACTOR WILL PROVIDE AND MAINTAIN SKILLED FLAGGERS EQUIPPED WITH TWO-WAY RADIOS TO HANDLE TRAFFIC THROUGH THE WORK AREAS.

5.) COMPLY WITH TCP(7-1)-13 WHICH INCLUDES PROVISIONS FOR CERTAIN SIGNS TO BE INSTALLED AND TO REMAIN UNTIL PERMANENT PAVEMENT MARKINGS ARE IN PLACE. THESE SIGNS ARE IN ADDITION TO SIGNS THAT MAY BE REQUIRED BY THE VARIOUS TCP AND BC STANDARDS.

DATE: $DATE$ FILE NAME: $FILE$

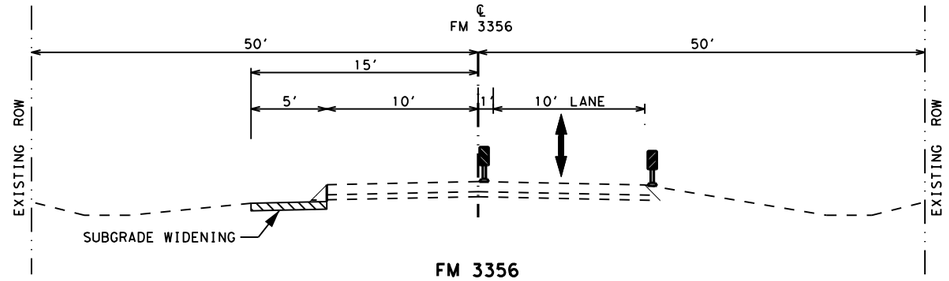
STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

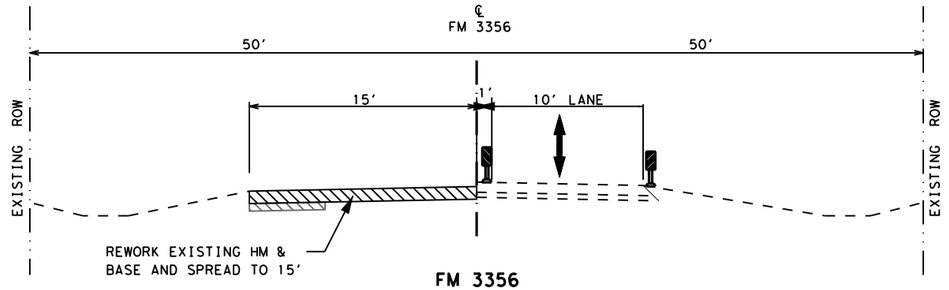
FM 3356
TRAFFIC CONTROL PLAN
SEQUENCE OF WORK
& GENERAL NOTES

SCALE: NTS

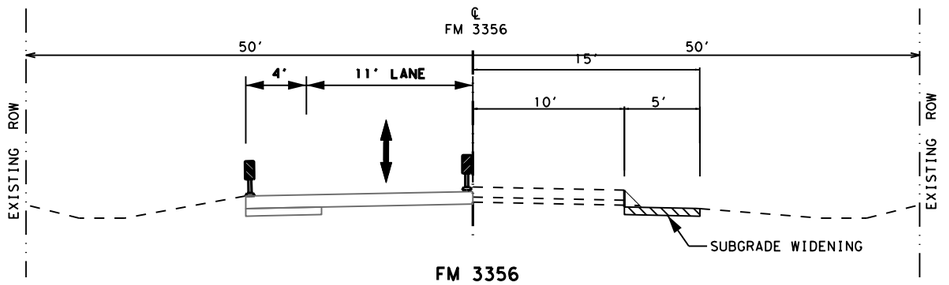
DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CS	TEXAS	DALLAS	COLLIN	
CHECK	CONTROL	SECTION	JOB	18
BAE				
CHECK	3427	03	007	
BDH				



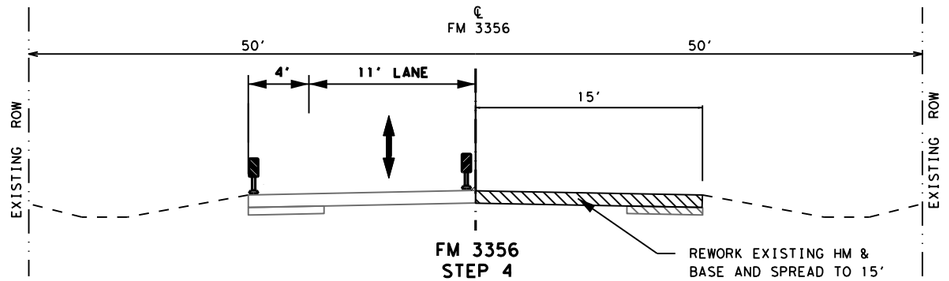
FM 3356
STEP 1
CONSTRUCTION OPERATION PRESENT



FM 3356
STEP 2
CONSTRUCTION OPERATION PRESENT



FM 3356
STEP 3
CONSTRUCTION OPERATION PRESENT



FM 3356
STEP 4
CONSTRUCTION OPERATION PRESENT

STEP 5 - CEMENT TREAT 6" X 30' WITH 1 LANE 2-WAY TRAFFIC

STEP 6 - 10" FLEXBASE X 29' WITH PRIME COAT AND OCST
WITH 1 LANE 2-WAY TRAFFIC

STEP 7 - EMBANK SLOPES

STEP 8 - 2" SP-C SAC-B OVERLAY X 28' WITH 1 LANE 2-WAY TRAFFIC

STEP 9 - BACKFILL PVMT EDGES

VERTICAL PANEL

NOTES:
1. TWO WAY TRAFFIC SHALL BE ESTABLISHED AT THE END OF EACH WORK DAY.
2. SEE CULVERT LAYOUTS FOR ADDITIONAL DETAIL.

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

FM 3356
TCP TYPICAL SECTIONS

SCALE: NTS

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CS	TEXAS	DALLAS	COLLIN	19
CHECK	CONTROL	SECTION	JOB	
MS	3427	03	007	
CHECK				
JRV				

FILE NAME: $FILE$
DATE: $DATE$

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

2. The development and design of the Traffic Control Plan (TCP)is the responsibility of the Engineer.

3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.

4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.

5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.

6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.

7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.

8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.

10. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.

11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.

12. The Engineer has the final decision on the location of all traffic control devices.

13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY NOTES:

1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.

2. Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.

2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

DATE: $DATE$ $TIME$
FILE: $FILE$

SHEET 1 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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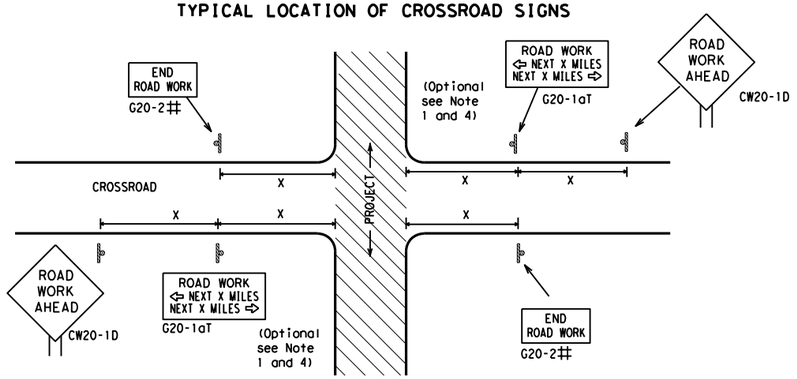
REVISIONS	3427	03	007	FM 3356
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	DAL	COLLIN		20
5-10 5-21				

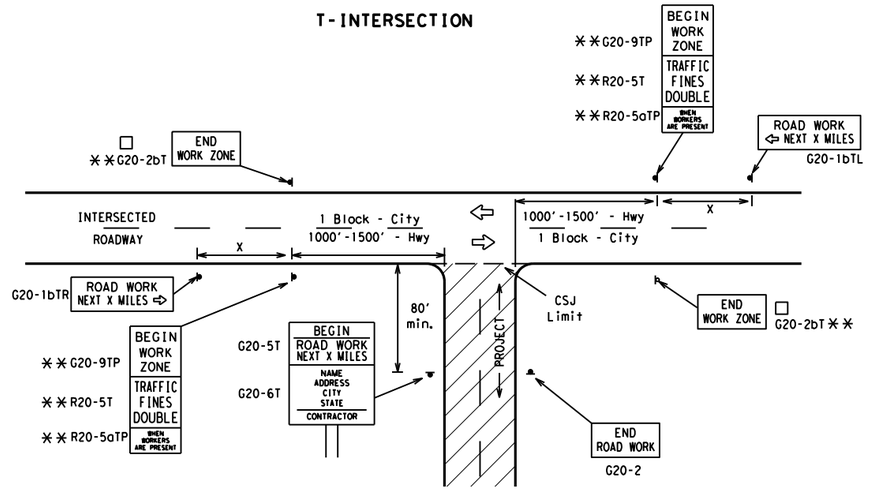
TYPICAL LOCATION OF CROSSROAD SIGNS



May be mounted on back of "ROAD WORK AHEAD"(CW20-1D) sign with approval of Engineer. (See note 2 below)

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume as per TMUTCD Part 5. This information shall be shown in the plans.
3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
4. The "ROAD WORK NEXT X MILES"(G20-1aT)sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

1. The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
2. If construction closes the road at a T-intersection, the Contractor shall place the "CONTRACTOR NAME"(G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow(G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR)" signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING[1,5,6]

SIZE

Sign Number or Series	Conventional Road	Expressway/ Freeway
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"

SPACING

Posted Speed	Sign △ Spacing "X"
MPH	Feet (Apprx.)
30	120
35	160
40	240
45	320
50	400
55	500[2]
60	600[2]
65	700[2]
70	800[2]
75	900[2]
80	1000[2]
*	*[3]

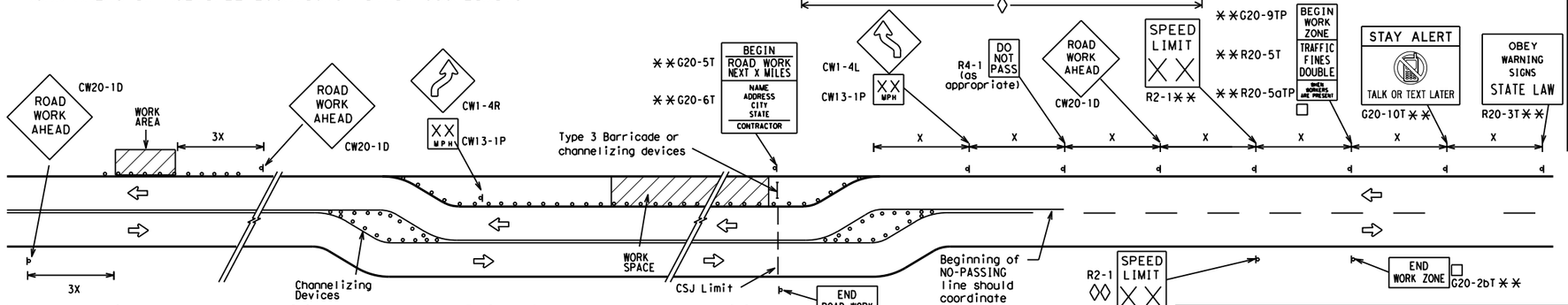
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

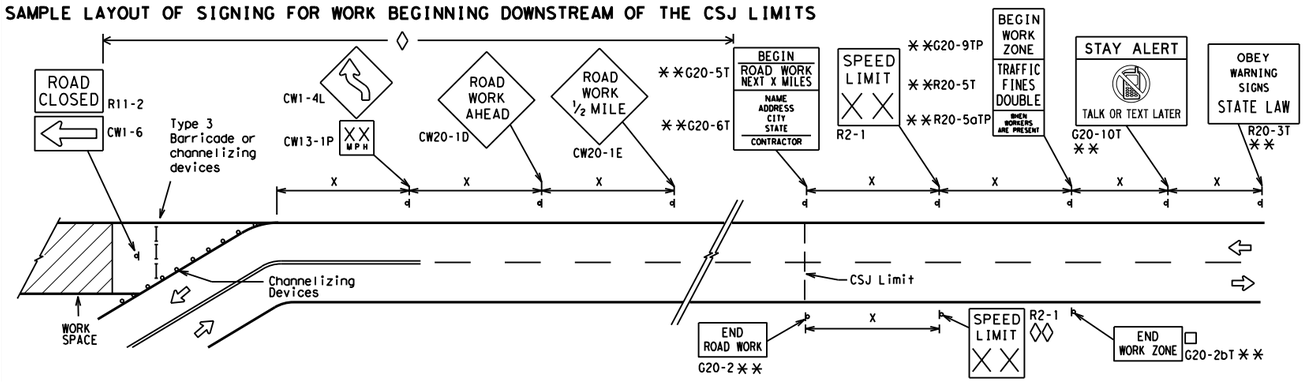
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer as per TMUTCD Part 5. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

□ The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

** CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.

◊ Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.

◊◊ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

⊢⊣	Type 3 Barricade
○ ○ ○	Channelizing Devices
▬	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	3427	03	007	FM 3356
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	COLLIN		21

DATE: $DATE$ $TIME$
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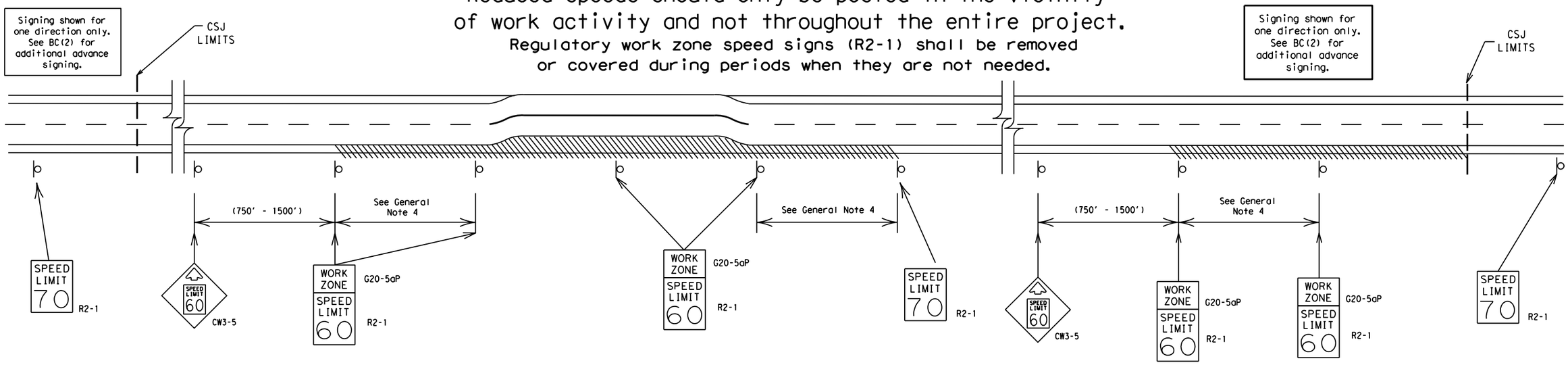
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.

Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the traveled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered.
(See Removing or Covering on BC(4)).

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

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BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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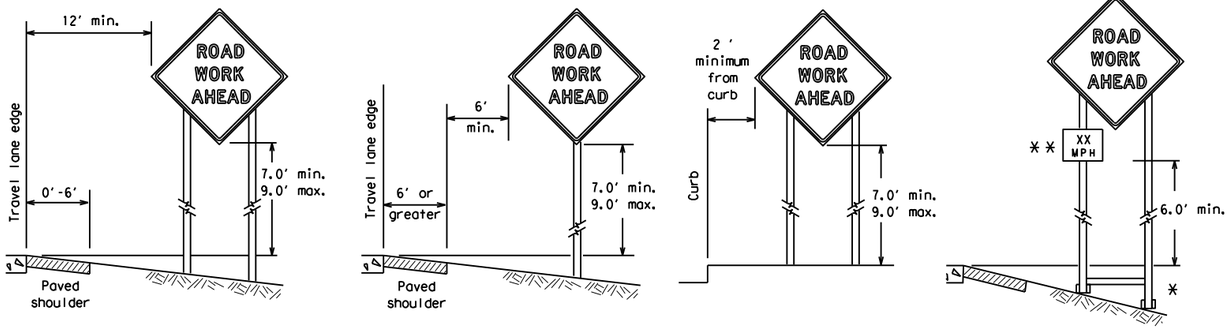
7-13 5-21	DAL	COLLIN		22

DATE: $DATE$ $TIME$
FILE: $FILE$

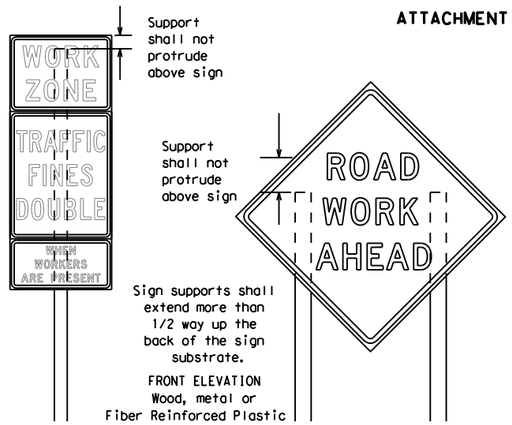
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

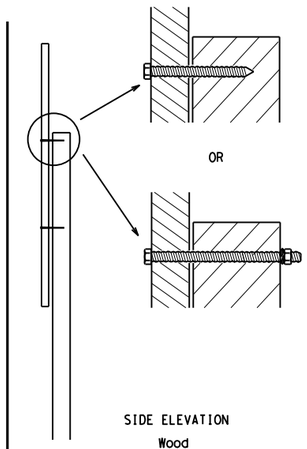


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS





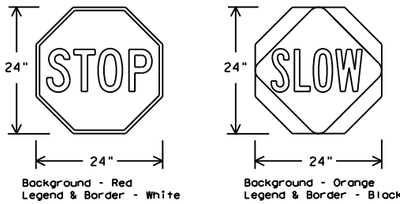
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
2. STOP/SLOW paddles shall be retroreflectorized when used at night.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, specific service (LOGO), or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition. For details for covering large guide signs see the TS-CD standard.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
5. If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC standard sheets, TLRS standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
6. Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets. The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
   a. Long-term stationary - work that occupies a location more than 3 days.
   b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
   c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
   d. Short, duration - work that occupies a location up to 1 hour.
   e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. Flags may be used to draw attention to warning signs. When used, the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

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BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	COLLIN		23

DATE: $DATE$ $TIME$
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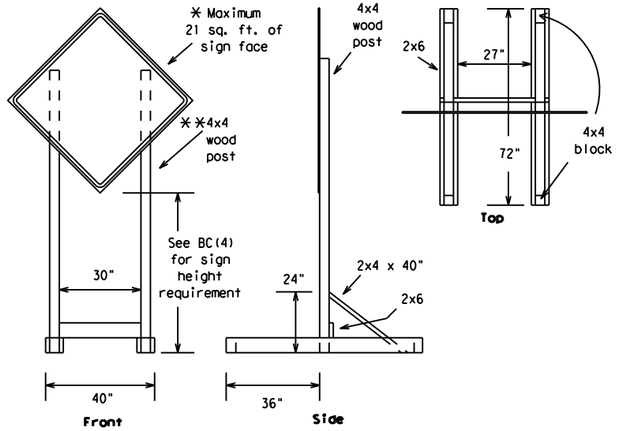
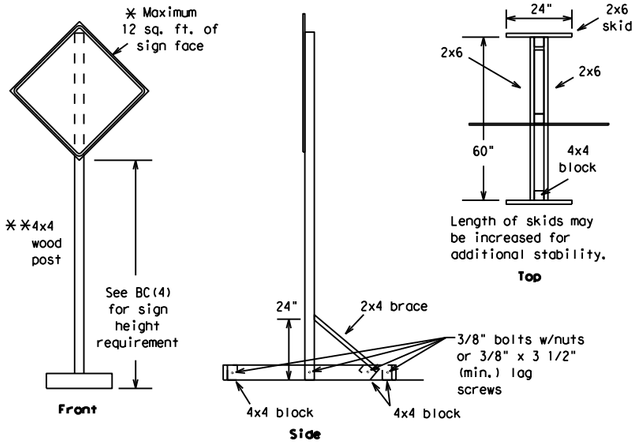
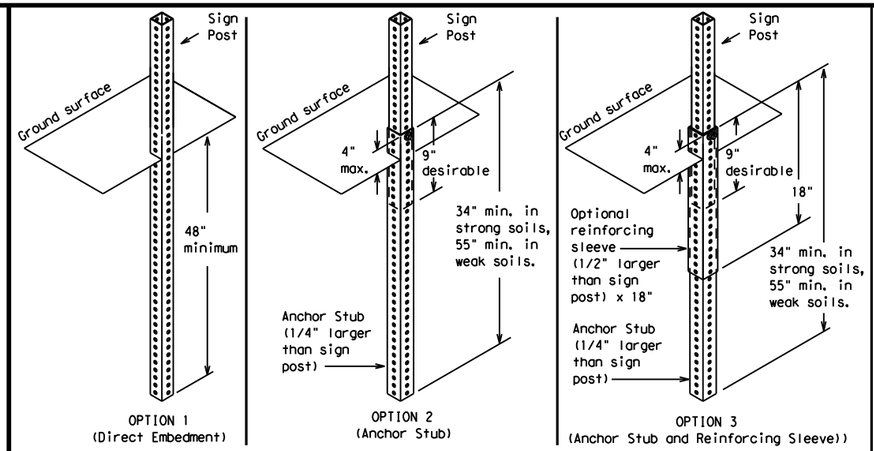




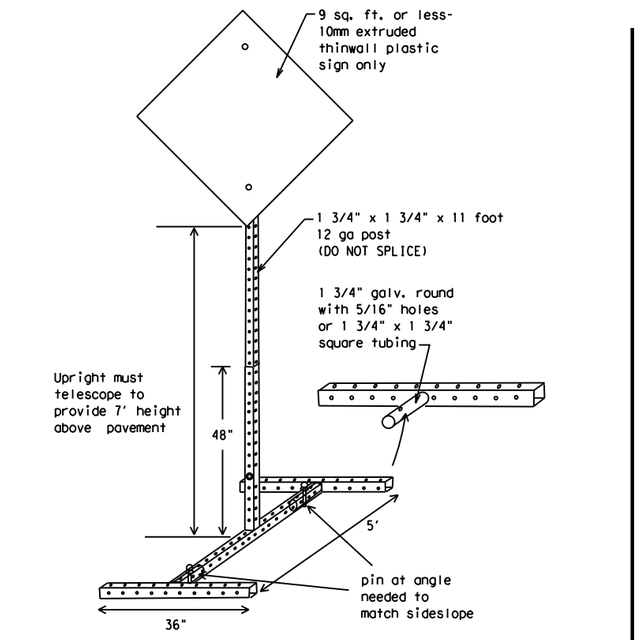
SKID MOUNTED WOOD SIGN SUPPORTS

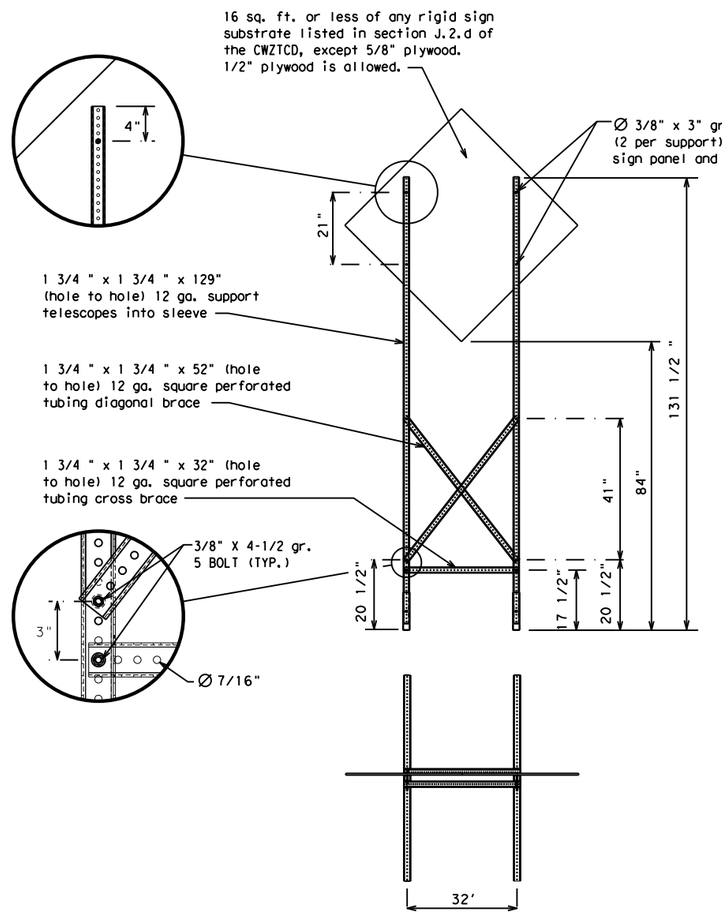
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

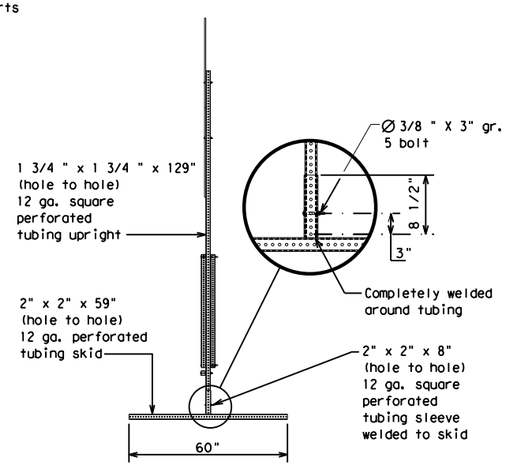


GROUND MOUNTED SIGN SUPPORTS

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support.
The maximum sign square footage shall adhere to the manufacturer's recommendation.
Two post installations can be used for larger signs.







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

OTHER DESIGNS

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

GENERAL NOTES

1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

* See BC(4) for definition of "Work Duration."

** Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

☐ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

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BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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7-13 5-21	DAL	COLLIN		24

DATE: $DATE$ $TIME$
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DATE: $DATE$ $TIME$
FILE: $FILE$

WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
3. Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

Roadway designation * IH-number, US-number, SH-number, FM-number

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

- FREEWAY CLOSED X MILE
- FRONTAGE ROAD CLOSED
- ROAD CLOSED AT SH XXX
- SHOULDER CLOSED XXX FT
- ROAD CLSD AT FM XXXX
- RIGHT LN CLOSED XXX FT
- RIGHT X LANES CLOSED
- RIGHT X LANES OPEN
- CENTER LANE CLOSED
- DAYTIME LANE CLOSURES
- NIGHT LANE CLOSURES
- I-XX SOUTH EXIT CLOSED
- VARIOUS LANES CLOSED
- EXIT XXX CLOSED X MILE
- EXIT CLOSED
- RIGHT LN TO BE CLOSED
- MALL DRIVEWAY CLOSED
- X LANES CLOSED TUE - FRI
- XXXXXXXX BLVD CLOSED

Other Condition List

- ROADWORK XXX FT
- ROAD REPAIRS XXXX FT
- FLAGGER XXXX FT
- LANE NARROWS XXXX FT
- RIGHT LN NARROWS XXXX FT
- TWO-WAY TRAFFIC XX MILE
- MERGING TRAFFIC XXXX FT
- CONST TRAFFIC XXX FT
- LOOSE GRAVEL XXXX FT
- UNEVEN LANES XXXX FT
- DETOUR X MILE
- ROUGH ROAD XXXX FT
- ROADWORK PAST SH XXXX
- ROADWORK NEXT FRI-SUN
- BUMP XXXX FT
- US XXX EXIT X MILES
- TRAFFIC SIGNAL XXXX FT
- LANES SHIFT *

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

- MERGE RIGHT
- FORM X LINES RIGHT
- DETOUR NEXT X EXITS
- USE XXXXX RD EXIT
- USE EXIT XXX
- USE EXIT I-XX NORTH
- STAY ON US XXX SOUTH
- USE I-XX E TO I-XX N
- TRUCKS USE US XXX N
- WATCH FOR TRUCKS
- WATCH FOR TRUCKS
- EXPECT DELAYS
- EXPECT DELAYS
- PREPARE TO STOP
- REDUCE SPEED XXX FT
- END SHOULDER USE
- USE OTHER ROUTES
- WATCH FOR WORKERS
- STAY IN LANE *

Location List

- AT FM XXXX
- BEFORE RAILROAD CROSSING
- NEXT X MILES
- PAST US XXX EXIT
- XXXXXXX TO XXXXXXX
- US XXX TO FM XXXX

Warning List

- SPEED LIMIT XX MPH
- MAXIMUM SPEED XX MPH
- MINIMUM SPEED XX MPH
- ADVISORY SPEED XX MPH
- RIGHT LANE EXIT
- USE CAUTION
- DRIVE SAFELY
- DRIVE WITH CARE

** Advance Notice List

- TUE-FRI XX AM- X PM
- APR XX-XX X PM-X AM
- BEGINS MONDAY
- BEGINS MAY XX
- MAY X-X XX PM - XX AM
- NEXT FRI-SUN
- XX AM TO XX PM
- NEXT TUE AUG XX
- TONIGHT XX PM- XX AM

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

1. Only 1 or 2 phases are to be used on a PCMS.
2. The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
3. A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
4. A Location Phase is necessary only if a distance or location is not included in the first phase selected.
5. If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
6. For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
2. Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
3. EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
4. Highway names and numbers replaced as appropriate.
5. ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
6. AHEAD may be used instead of distances if necessary.
7. FT and MI, MILE and MILES interchanged as appropriate.
8. AT, BEFORE and PAST interchanged as needed.
9. Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

1. When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
2. When symbol signs, such as the "Flagger Symbol"(CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
3. When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
4. A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

Texas Department of Transportation

Traffic Safety Division Standard

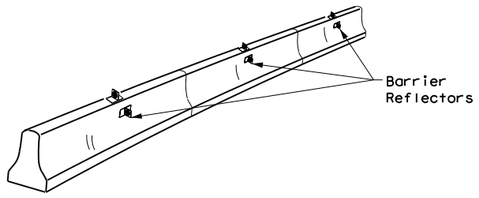
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	COLLIN		25

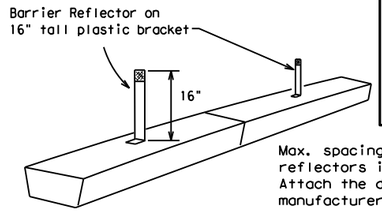
100

1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



CONCRETE TRAFFIC BARRIER (CTB)

3. Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
4. Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional)while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
5. When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
6. Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
7. Maximum spacing of Barrier Reflectors is forty (40) feet.
8. Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
9. Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
10. Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
11. Single slope barriers shall be delineated as shown on the above detail.

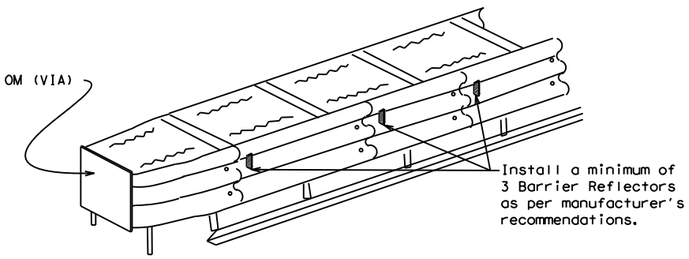


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

LOW PROFILE CONCRETE BARRIER (LPCB)

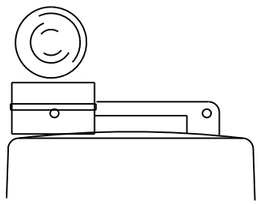


DELINEATION OF END TREATMENTS

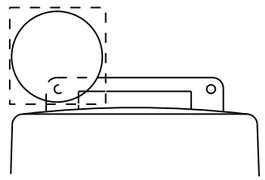
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the apppropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square.Must have a yellow reflective surface area of at least 30 square inches

WARNING LIGHTS

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
4. Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
6. When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
7. When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
8. The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

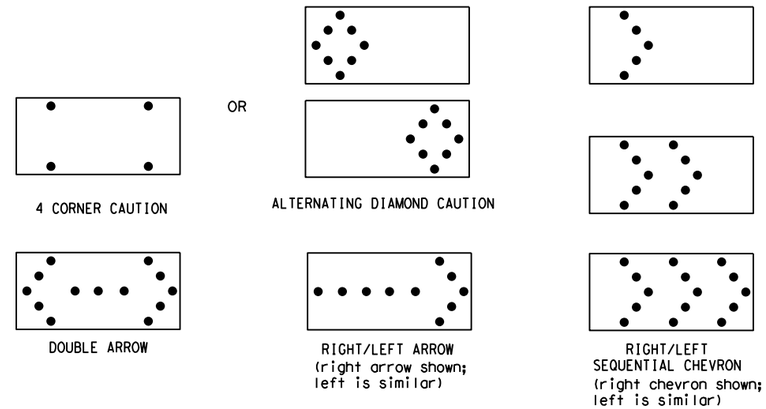
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
4. Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
5. Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
6. Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
7. The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

1. A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
2. The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
3. The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
4. Round reflectors shall be fully reflectorized, including the area where attached to the drum.
5. Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
6. The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
7. When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
8. The warning reflector should be mounted on the side of the handle nearest approaching traffic.
9. The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

1. The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
2. Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
3. The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
4. The Flashing Arrow Board should be able to display the following symbols:



5. The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
6. The straight line caution display is NOT ALLOWED.
7. The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
8. Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
9. The sequential arrow display is NOT ALLOWED.
10. The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
11. The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
12. A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
13. A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
14. Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	COLLIN		26

101

DATE: $DATE$ $TIME$
FILE: $FILE$

GENERAL NOTES

1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections, one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
3. For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
4. Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
6. The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

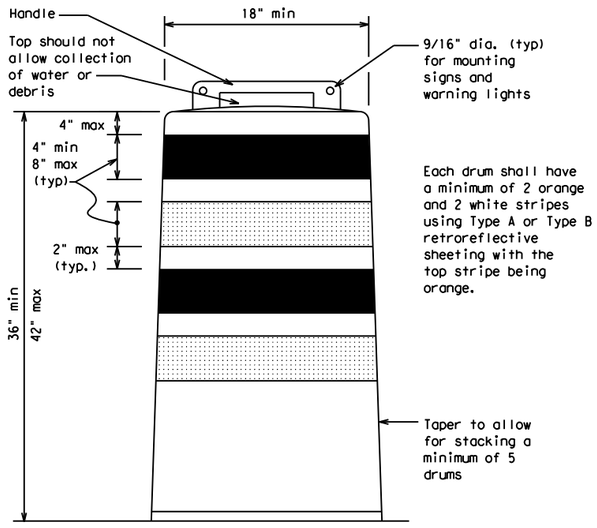
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
3. Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
4. Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
5. The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
6. The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
7. Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unballasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

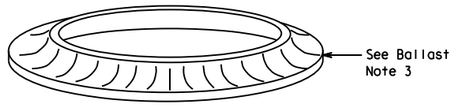
RETROREFLECTIVE SHEETING

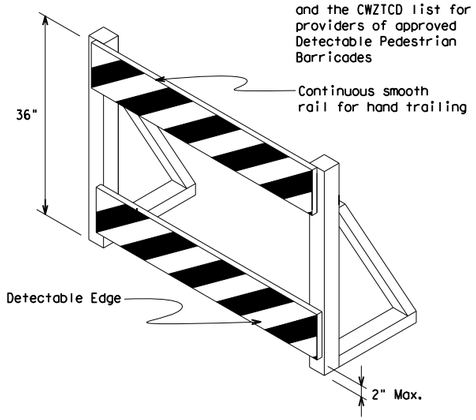
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
2. Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
3. Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
4. The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
5. When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
6. Ballast shall not be placed on top of drums.
7. Adhesives may be used to secure base of drums to pavement.

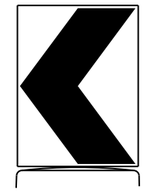




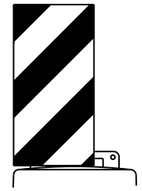


DETECTABLE PEDESTRIAN BARRICADES

1. When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
3. Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
4. Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines (ADAAG)" and should not be used as a control for pedestrian movements.
5. Warning lights shall not be attached to detectable pedestrian barricades.
6. Detectable pedestrian barricades should use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24"
Vertical Panel
mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

1. Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
2. Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
3. Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
4. Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
5. Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
7. Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations, they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
8. R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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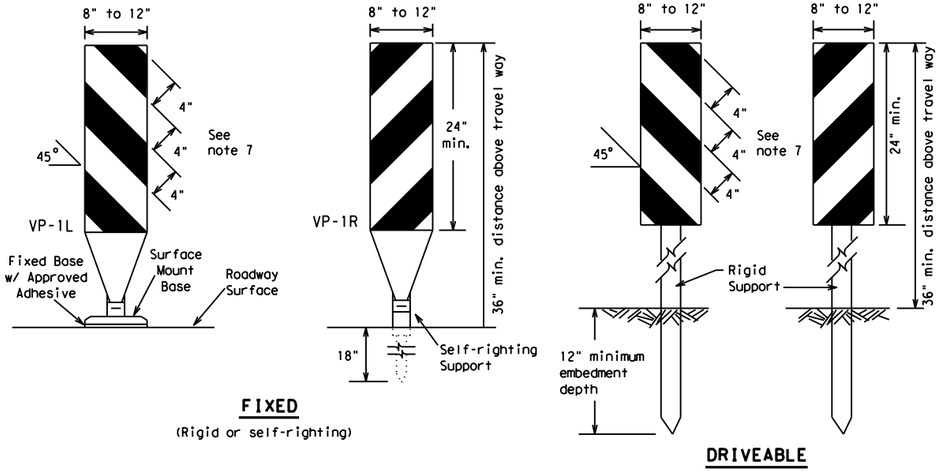
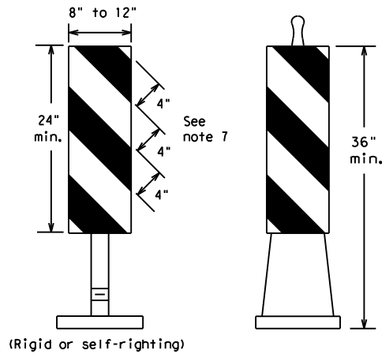


FIXED
(Rigid or self-righting)

DRIVEABLE

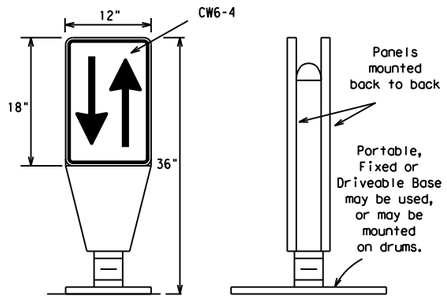


(Rigid or self-righting)

PORTABLE

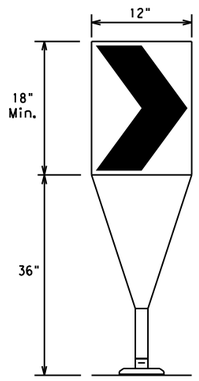
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual for additional requirements on the use VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



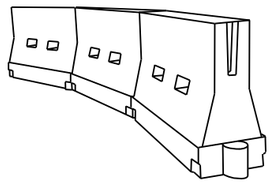
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways, self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

GENERAL NOTES

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10). Place reflective sheeting near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

Posted Speed	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

** Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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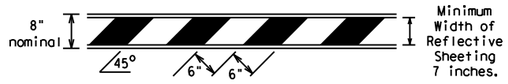
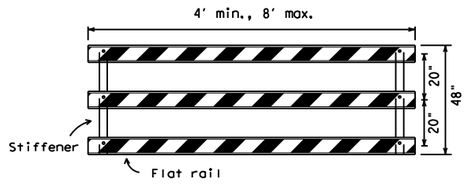
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road, striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



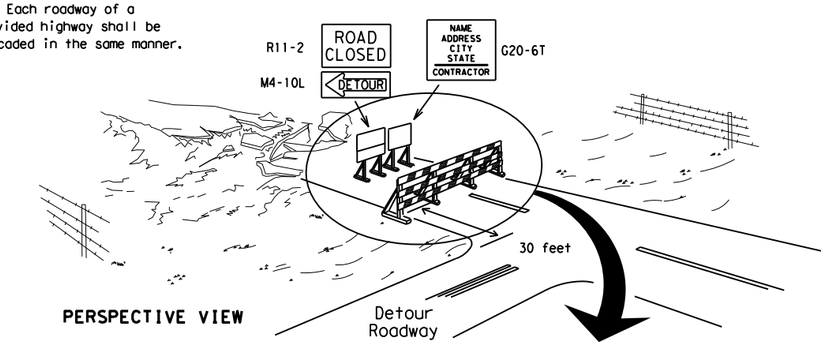
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

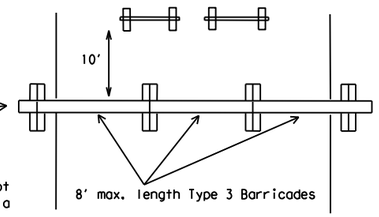
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

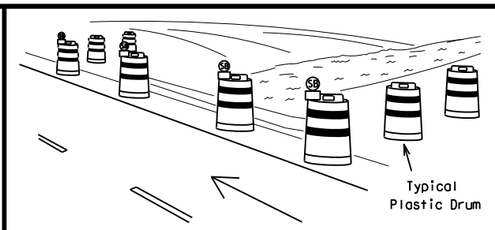
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

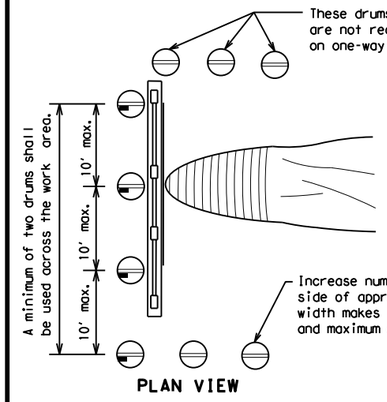
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

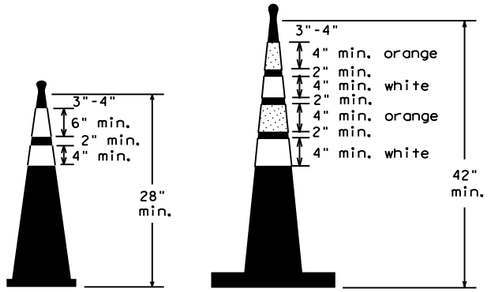
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.



LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

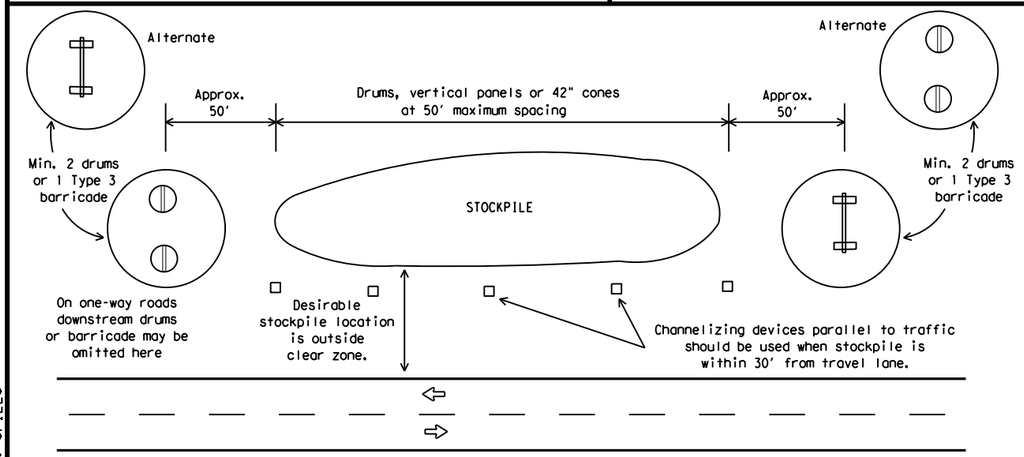
PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" Cones shall have a minimum weight of 9 1/2 lbs.
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A or Type B.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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WORK ZONE PAVEMENT MARKINGS

GENERAL

1. The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
3. Additional supplemental pavement marking details may be found in the plans or specifications.
4. Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
5. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
6. When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
7. All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

1. Raised pavement markers are to be placed according to the patterns on BC(12).
2. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

1. Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
2. Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

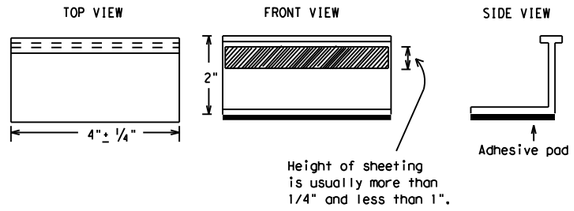
MAINTAINING WORK ZONE PAVEMENT MARKINGS

1. The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
2. Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
3. The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
4. Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

1. Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
2. The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
3. Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
7. Over-painting of the markings SHALL NOT BE permitted.
8. Removal of raised pavement markers shall be as directed by the Engineer.
9. Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
10. Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

1. Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
2. Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
   A. Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
   B. Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
3. Small design variances may be noted between tab manufacturers.
4. See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

1. Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
2. All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
3. Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:
YELLOW - (two amber reflective surfaces with yellow body).
WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

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BC(11)-21

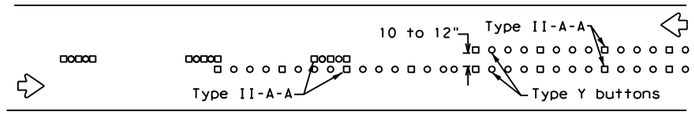
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	DAL	COLLIN		30
11-02 8-14				

105

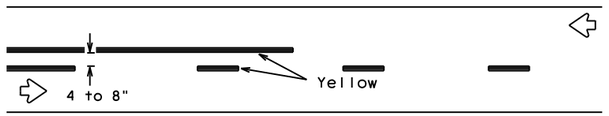
DATE: $DATE$ $TIME$
FILE: $FILE$

PAVEMENT MARKING PATTERNS

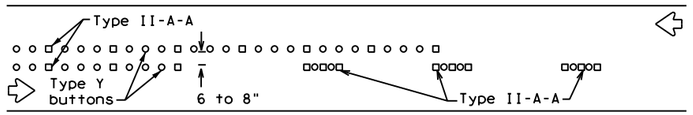
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



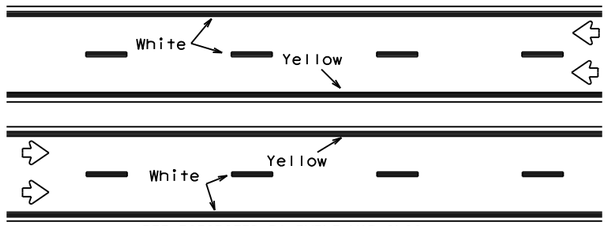
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



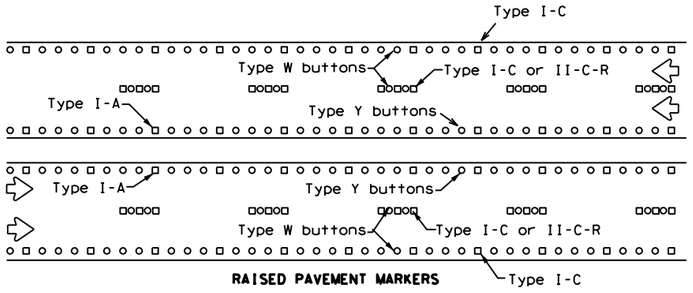
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be substituted for reflectorized pavement markings.

CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



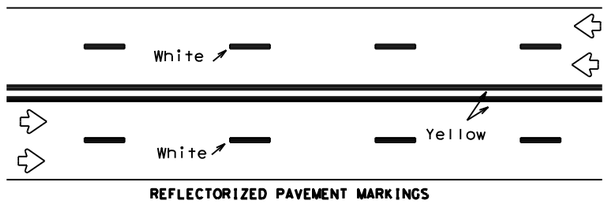
REFLECTORIZED PAVEMENT MARKINGS



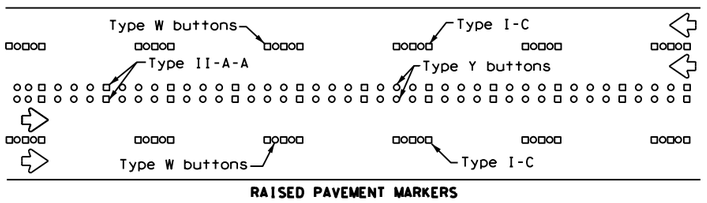
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



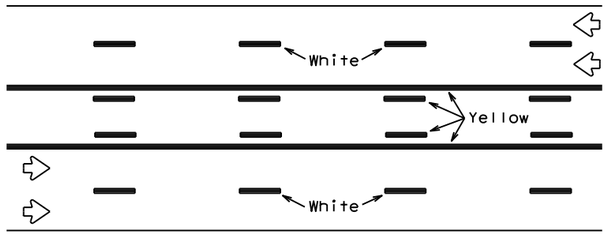
REFLECTORIZED PAVEMENT MARKINGS



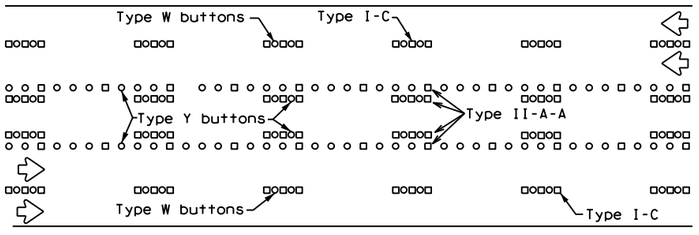
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

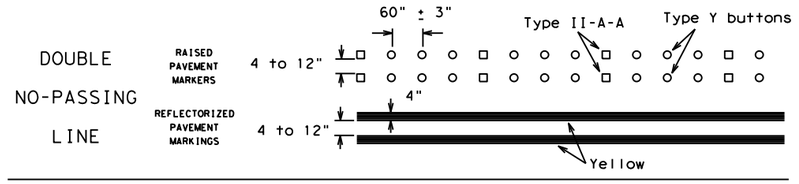
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

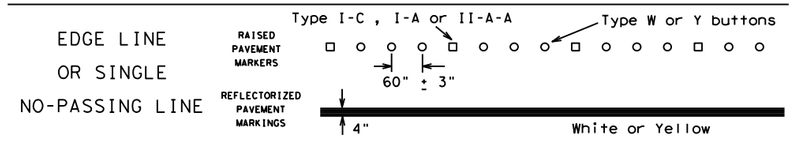
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

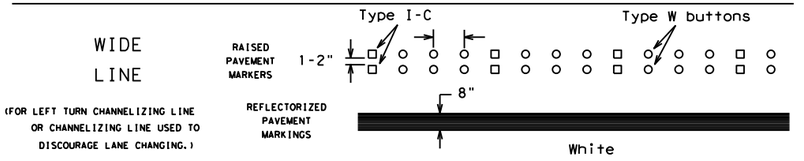


EDGE LINE OR SINGLE NO-PASSING LINE



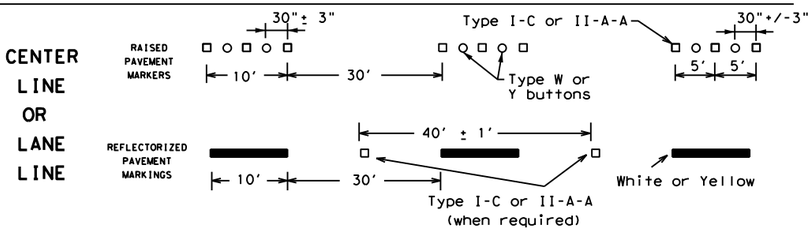
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

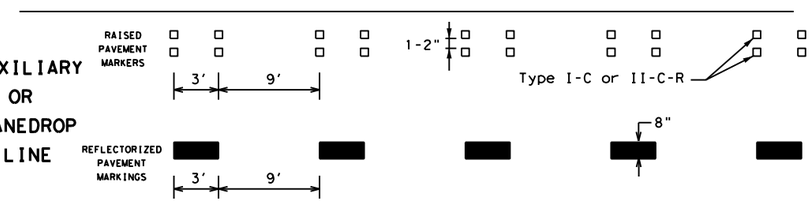


BROKEN LINES

CENTER LINE OR LANE LINE

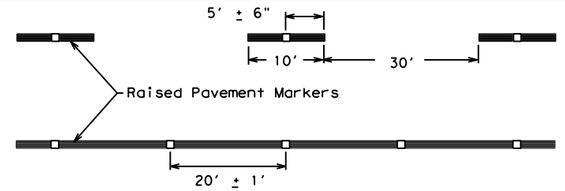


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Centerline only - not to be used on edge lines

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

Texas Department of Transportation

Traffic Safety Division Standard

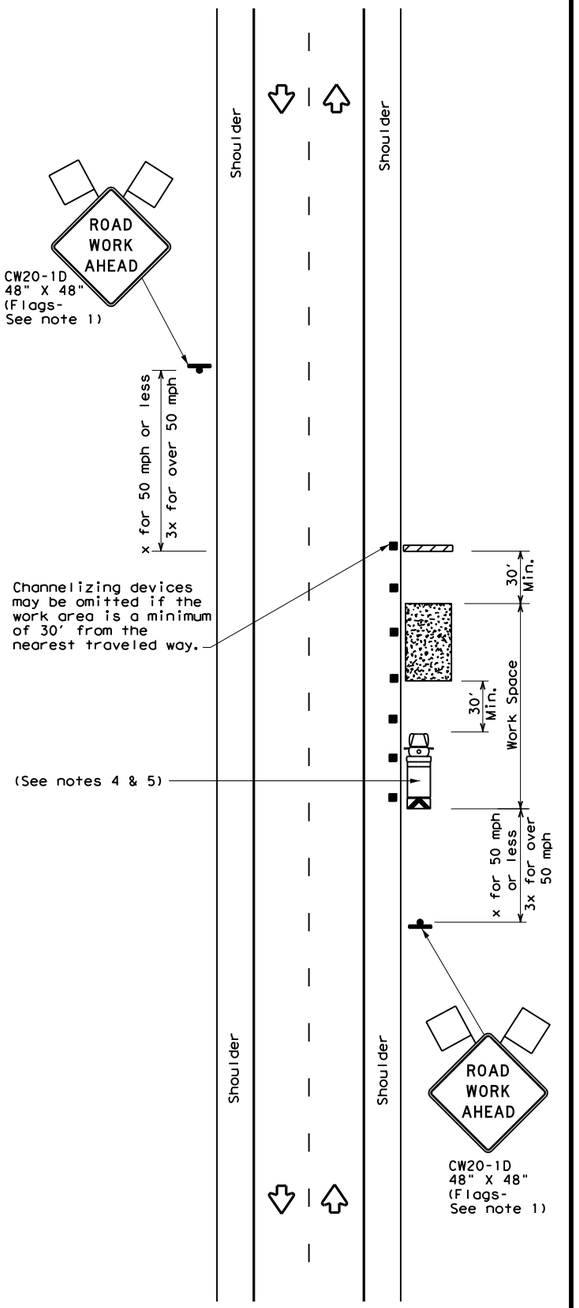
BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		31

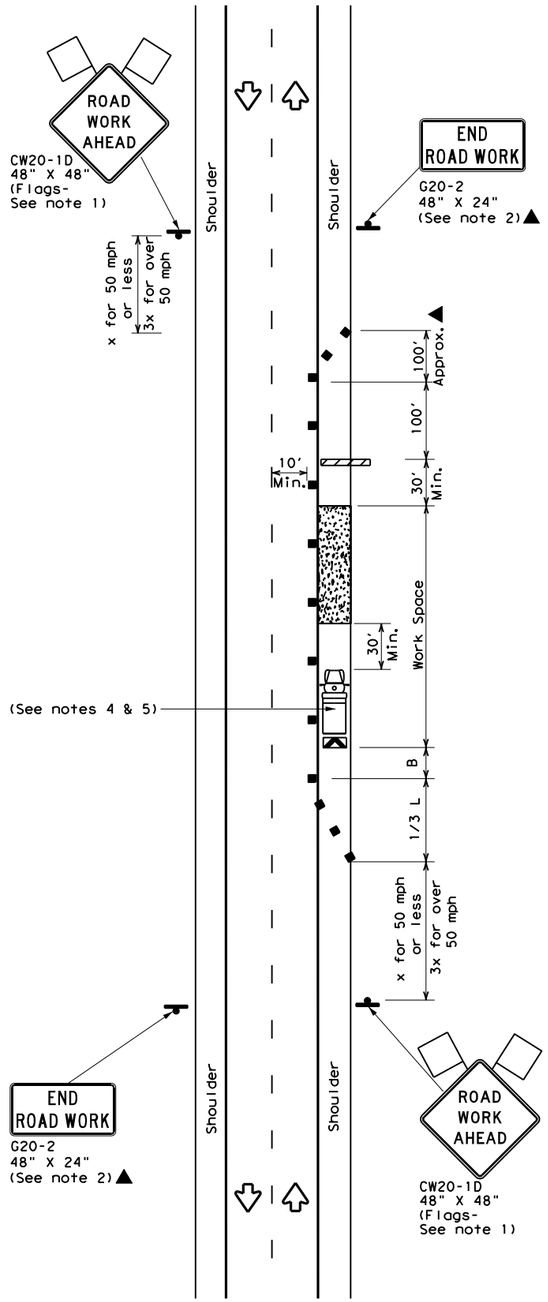
106

DATE: $DATE$ $TIME$
FILE: $FILE$



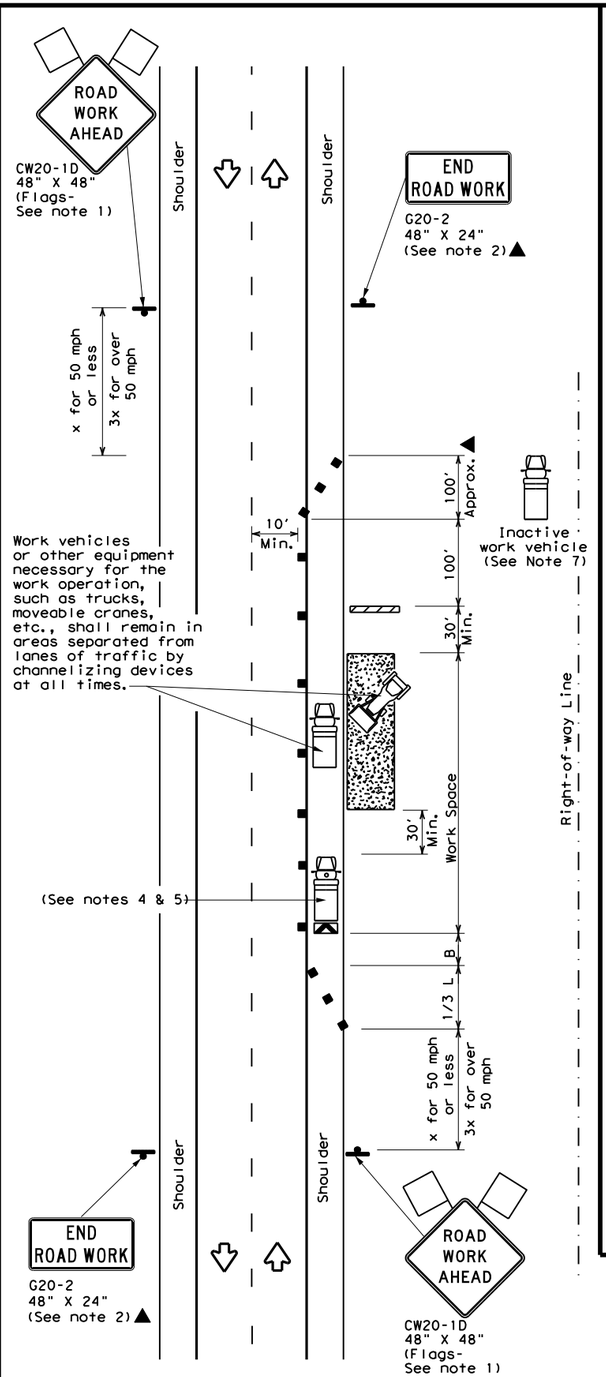
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND			
	Type 3 Barricade	■ ■	Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	✓

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
3. Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
8. CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation

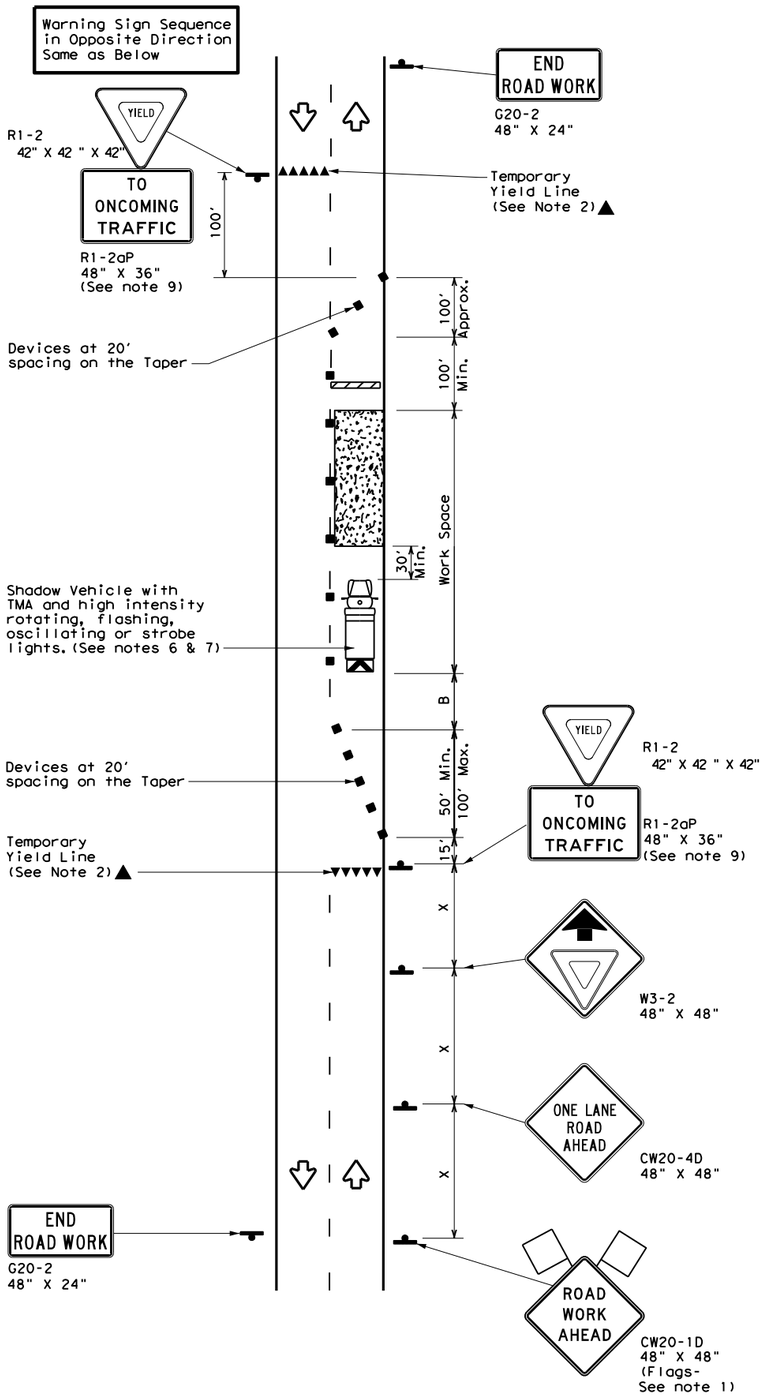
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

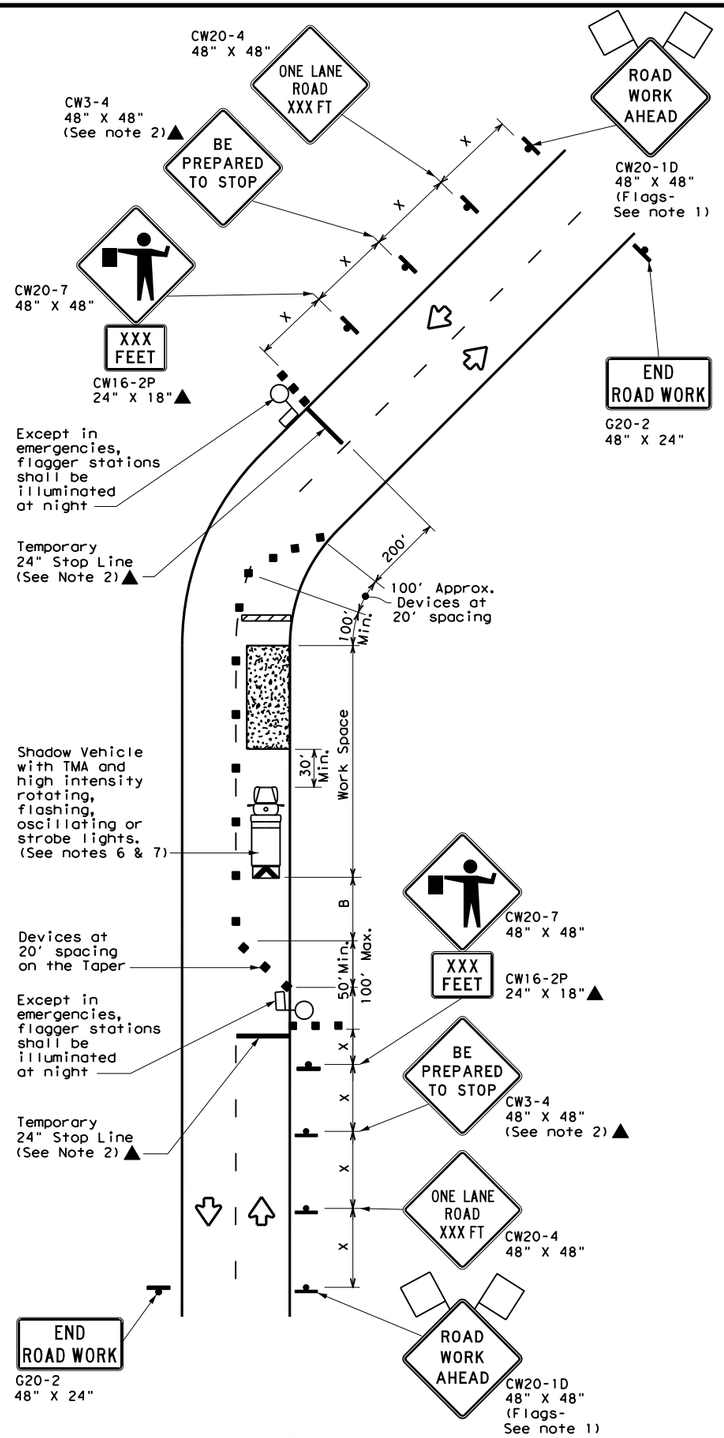
TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	DAL	COLLIN		32
1-97 2-18				

DATE: $DATE$ $TIME$
FILE: $FILE$



TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



TCP (2-2b)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

LEGEND

	Type 3 Barricade	■ ■	Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L=WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

* Conventional Roads Only
** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4 "ONE LANE ROAD XXX FT" sign, but proper sign spacing shall be maintained.
4. Flaggers should use two-way radios or other methods of communication to control traffic.
5. Length of work space should be based on the ability of flaggers to communicate.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-2a)

8. The R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work space should be no longer than one half city block. In rural areas, roadways with less than 2000 ADT, work space should be no longer than 400 feet.
9. The R1-2aP "YIELD TO ONCOMING TRAFFIC" sign shall be placed on a support at a 7 foot minimum mounting height.

TCP (2-2b)

10. Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a queue of stopped vehicles. (See table above).
12. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situtations.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		33

DATE: $DATE$ $TIME$
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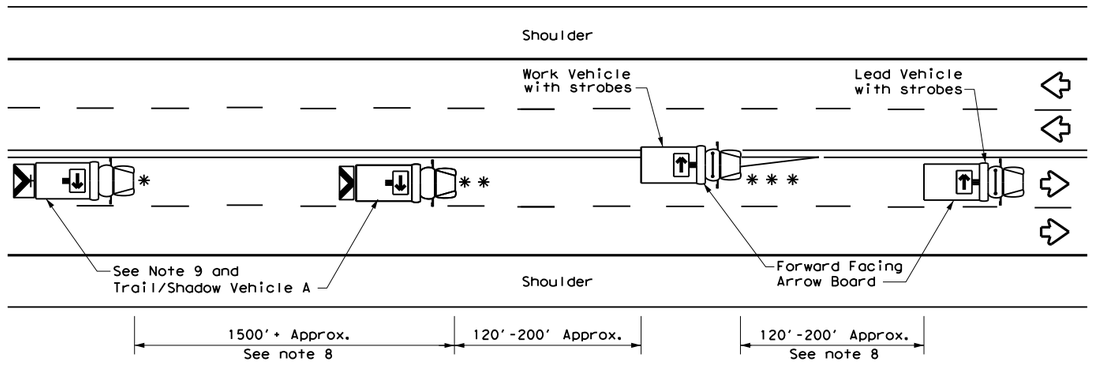
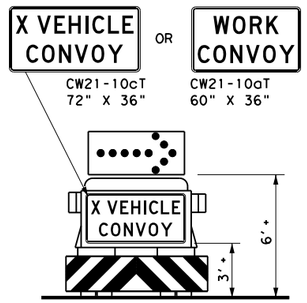


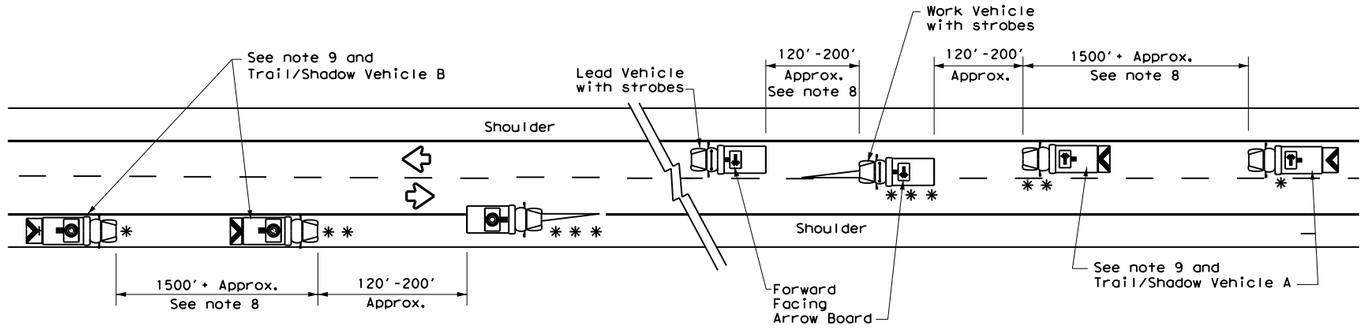
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

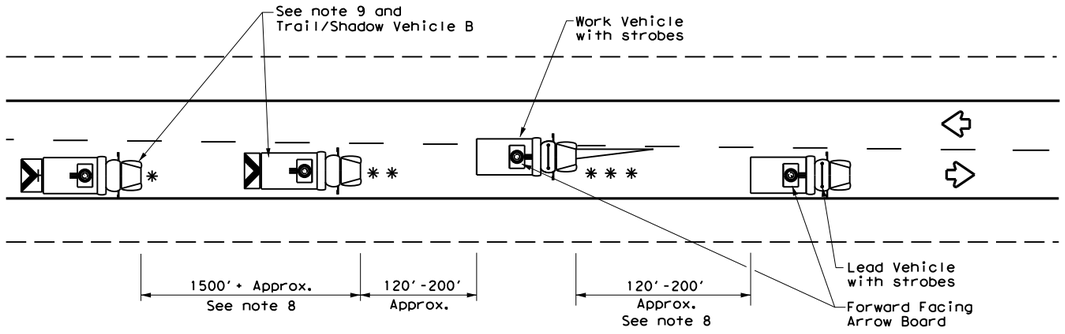


WORK ON SHOULDER

WORK ON TRAVEL LANE

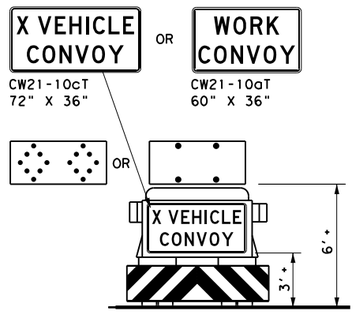
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

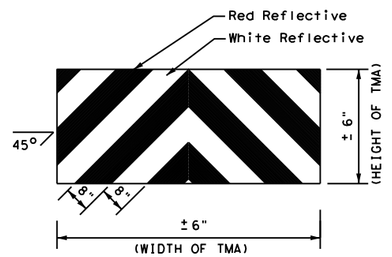
with Flashing Arrow Board in CAUTION display

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
✓				

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY"(CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

Texas Department of Transportation

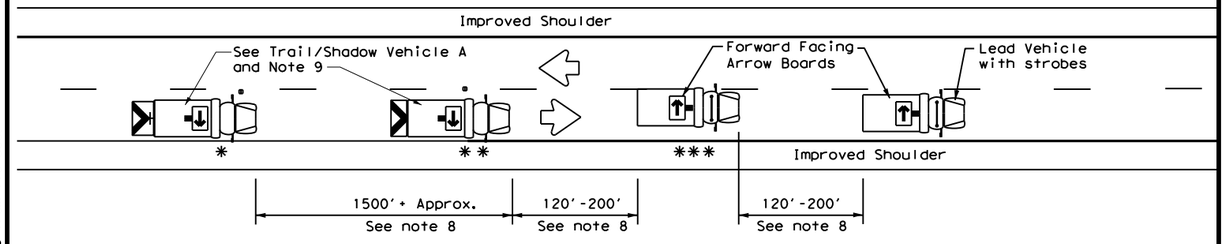
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

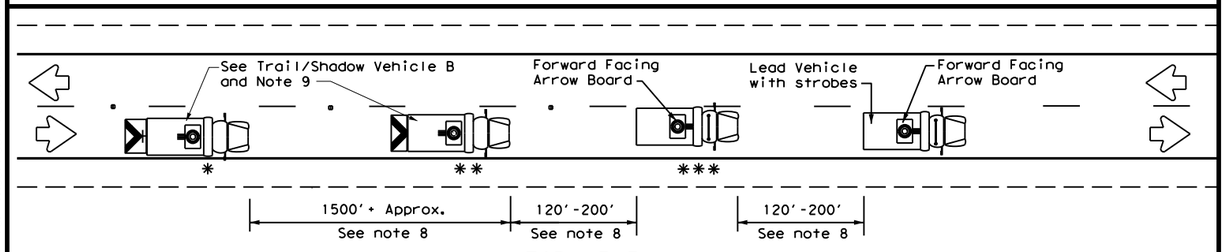
FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	DAL	COLLIN		34
1-97				

DATE: $DATE$ $TIME$
FILE: $FILE$



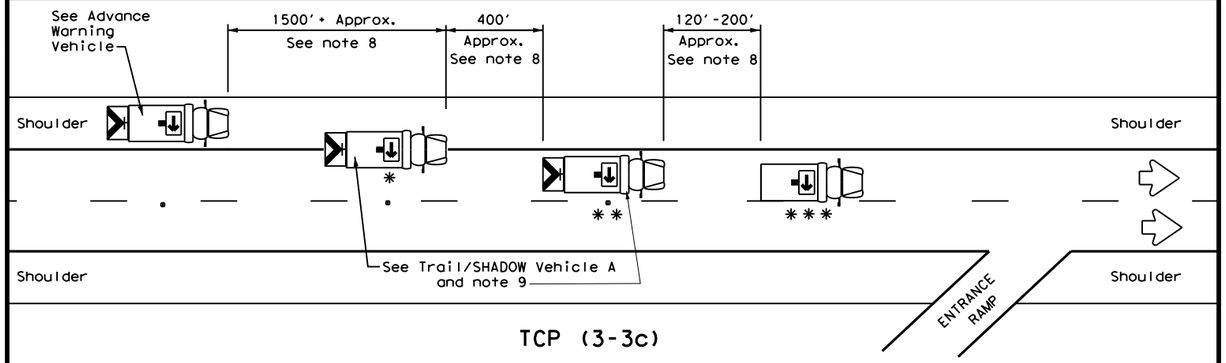
TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS
(WORK ON TRAVEL LANE)



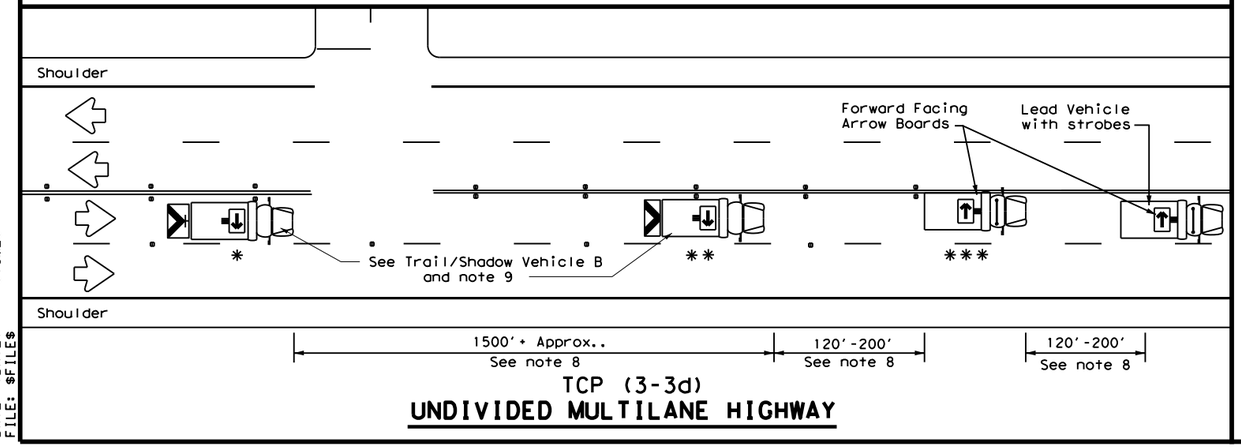
TCP (3-3b)

TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS
(WORK ON TRAVEL LANE)



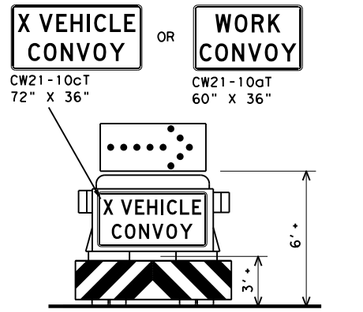
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



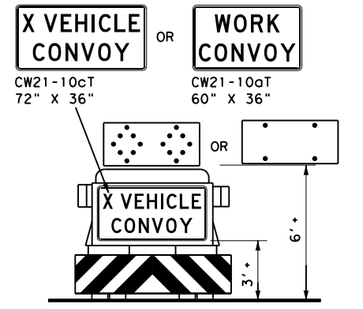
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



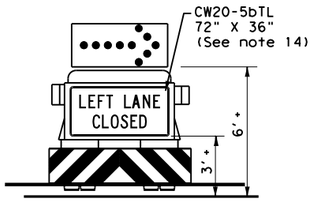
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

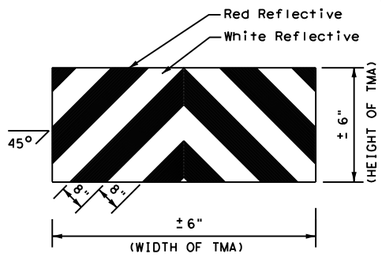


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
✓				

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used on two way roads the WORK vehicle must have an arrow board. For divided roadways, the arrow board on the WORK vehicle is optional based on the type of work being performed. The Engineer will determine if the LEAD vehicle and/or TRAIL vehicle are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating, or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE, ADVANCE WARNING and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. X VEHICLE CONVOY (CW21-10cT) or WORK CONVOY (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" x 48" diamond shaped WORK CONVOY (CW21-10T) or X VEHICLE CONVOY (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The X VEHICLE CONVOY sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. For divided highways with two or three lanes in one direction, the appropriate LEFT LANE CLOSED (CW20-5bTL), RIGHT LANE CLOSED (CW20-5bTR), or CENTER LANE CLOSED (CW20-5dT) sign should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board may be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
11. A double arrow shall not be displayed on the arrow board on the Advance Warning Vehicle.
12. For divided highways with three or four lanes in each direction, use TCP(3-2).
13. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
14. The Advance Warning Vehicle may straddle the edgeline when Shoulder width makes it necessary.
15. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a DO NOT PASS (R4-1) sign should be placed on the back of the rearmost protection vehicle.

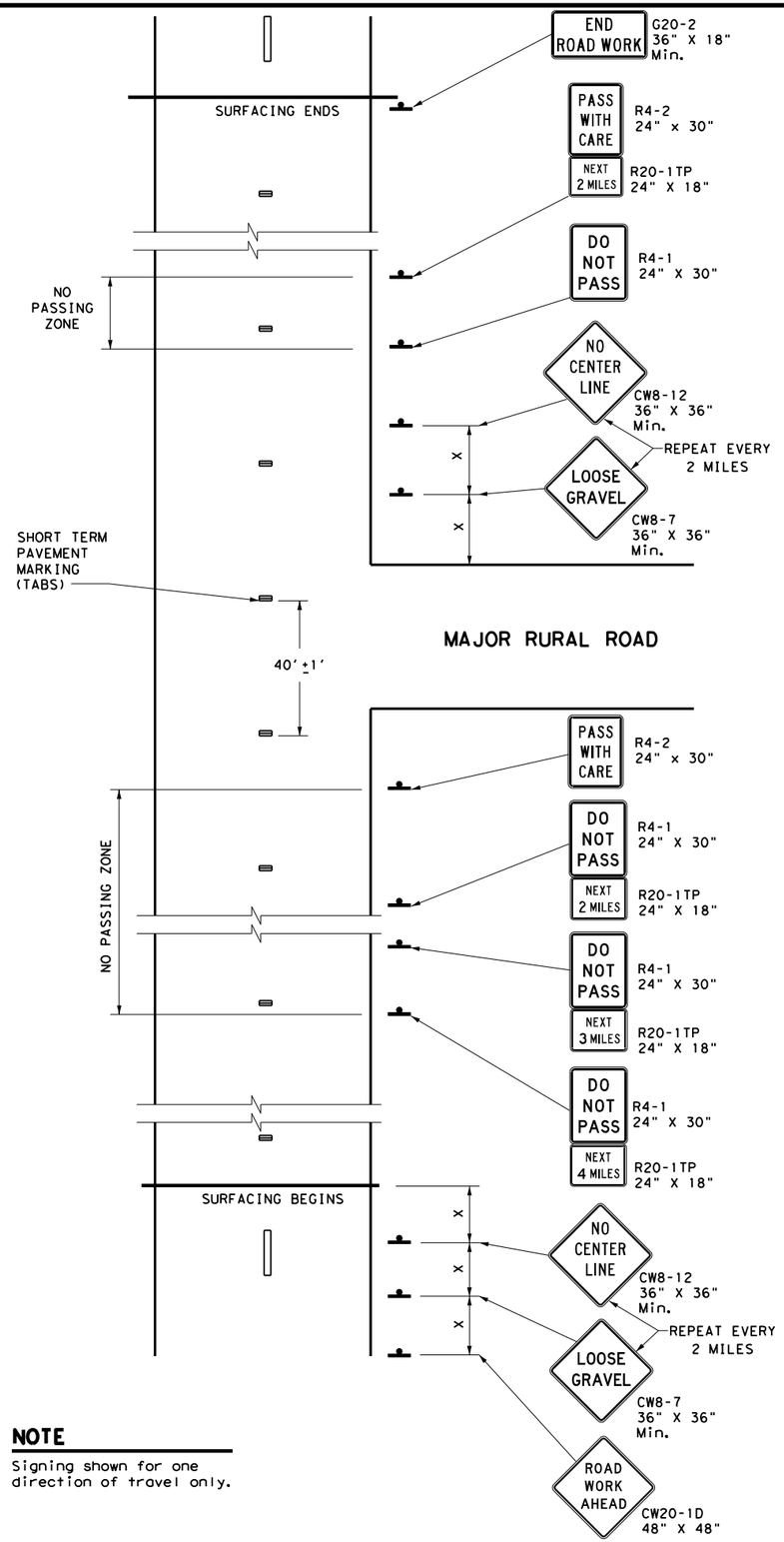
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
MOBILE OPERATIONS
RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL
TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	003	FM 3356
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	DAL	COLLIN		35
1-97 7-14				

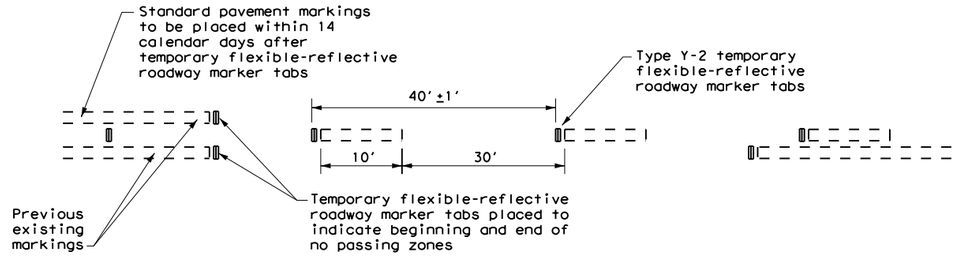
$TIME$
DATE: $DATE$
FILE: $FILE$



NOTE

Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS

For seal coat, micro-surface or similar operations

"DO NOT PASS" SIGN (R4-1) and NO-PASSING ZONES

A. Prior to the beginning of construction, all currently striped no-passing zones shall be signed with the DO NOT PASS (R4-1) signs and PASS WITH CARE (R4-2) signs placed at the beginning and end of each zone for each direction of travel except as otherwise provided herein. Signs marking these individual no-passing zones need not be covered prior to construction if the signs supplement the existing pavement markings.

B. At the discretion of the Engineer, in areas of numerous no-passing zones, several zones may be combined as a single zone. If passing is to be prohibited over one or more lengthy sections, a DO NOT PASS sign and a NEXT XX MILES (R20-1TP) plaque may be used at the beginning of such zones. The DO NOT PASS sign and the NEXT XX MILES plaque should be repeated every mile to the end of the no-passing zone. In areas where there is considerable distance between no-passing zones, the end of the no-passing zone may be signed with a PASS WITH CARE sign and a NEXT XX MILES plaque.

C. Depending on traffic volumes and length of sections, it may be desirable to prohibit passing throughout the project to prevent damage to windshield and lights. The DO NOT PASS sign and NEXT XX MILES plaque should be used and repeated as often as necessary for this purpose. Where several existing zones are to be combined into one individual no-passing zone, the sign at the beginning of the zone should be covered until the surfacing operation has passed this location so as not to have the DO NOT PASS sign conflict with the existing pavement markings. Also, unless one days operation completes the entire length of such combined zones, appropriate DO NOT PASS and PASS WITH CARE signs should be placed at the beginning and end of the no-passing zones where the surfacing operation has stopped for the day.

D. R4-1 and R4-2 are to remain in place until standard pavement markings are installed.

"NO CENTER LINE" SIGN (CW8-12)

A. Center line markings are yellow pavement markings that delineate the separation of travel lanes that have opposite directions of travel on a roadway. Divided highways do not typically have center line markings.

B. At the time construction activity obliterates the existing center line markings(low volume roads may not have an existing centerline), a NO CENTER LINE (CW8-12) sign should be erected at the beginning of the work area, at approximately 2 mile intervals within the work area, beyond major intersections and other locations deemed necessary by the Engineer.

C. The NO CENTER LINE signs are to remain in place until standard pavement markings are installed.

"LOOSE GRAVEL" SIGN (CW8-7)

A. When construction begins, a LOOSE GRAVEL (CW8-7) sign should be erected at each end of the work area and repeated at intervals of approximately 2 miles in rural areas and closer in urban areas.

B. The LOOSE GRAVEL signs are to remain in place until the condition no longer exists.

PAVEMENT MARKINGS

A. Temporary markings for surfacing projects shall be Temporary Flexible-reflective Roadway Marker Tabs unless otherwise approved by the Engineer. Tabs are to be installed to provide true alignment for striping crews or as directed by the Engineer. Tabs will be placed at the spacing indicated. Tabs should be applied to the pavement
no more than two (2) days before the surfacing is applied. After the surfacing is rolled and swept, the cover over the reflective strip shall be removed.

B. Tabs shall not be used to simulate edge lines.

C. Tab placement for overlay/inlay operations shall be as shown on the WZ(STPM) standard sheet.

COORDINATION OF SIGN LOCATIONS

A. The location of warning signs at the beginning and end of a work area are to be coordinated with other signing typically shown on the Barricade and Construction Standards for project limits to ensure adequate sign spacing.

B. Where possible the ROAD WORK AHEAD (CW20-1D), LOOSE GRAVEL (CW8-7), and NO CENTER LINE (CW8-12) signs should be placed in the sequence shown following the OBEY WARNING SIGNS STATE LAW (R20-3T) and the TRAFFIC FINES DOUBLE (R20-5T) sign, and one "X" sign spacing prior to the CONTRACTOR (G20-6T)sign typically located at or near the limits of surfacing. LOOSE GRAVEL and NO CENTER LINE signs will then be repeated as described above.

Posted Speed *	Minimum Sign Spacing "X" Distance
30	120'
35	160'
40	240'
45	320'
50	400'
55	500'
60	600'
65	700'
70	800'
75	900'

* Conventional Roads Only

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
			✓	✓

GENERAL NOTES

1. The traffic control devices detailed on this sheet will be furnished and erected as directed by the Engineer on sections of roadway where tabs must be placed prior to the surfacing operation which will cover or obliterate the existing pavement markings.
2. The devices shown on this sheet are to be used to supplement those required by the BC Standards or others required elsewhere in the plans.
3. Signs shall be erected as detailed on the BC Standards or the Compliant Work Zone Traffic Control Devices List (CWZTCD) on supports approved for Long-Term / Intermediate-Term Work Zone Sign Supports.
4. When surfacing operations take place on divided highways, freeways or expressways, the size of diamond shaped construction warning signs shall be 48" x 48".
5. Signs on divided highways, freeways and expressways will be placed on both right and left sides of the roadway based on roadway conditions as directed by the Engineer.

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

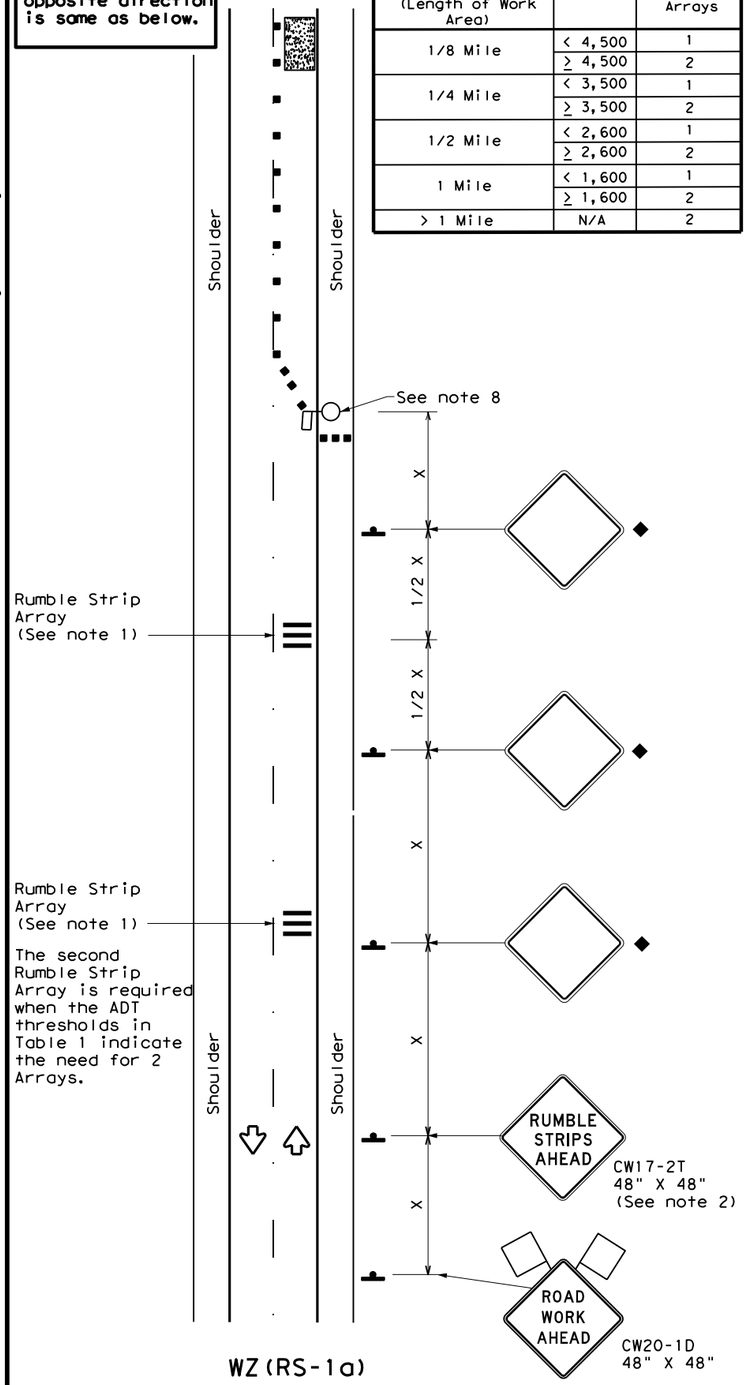
TCP(7-1)-13

FILE: tcp7-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 1991	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
4-92 4-98	DIST	COUNTY		SHEET NO.
1-97 7-13	DAL	COLLIN		36

DATE: $DATE$ $TIME$
FILE: $FILE$

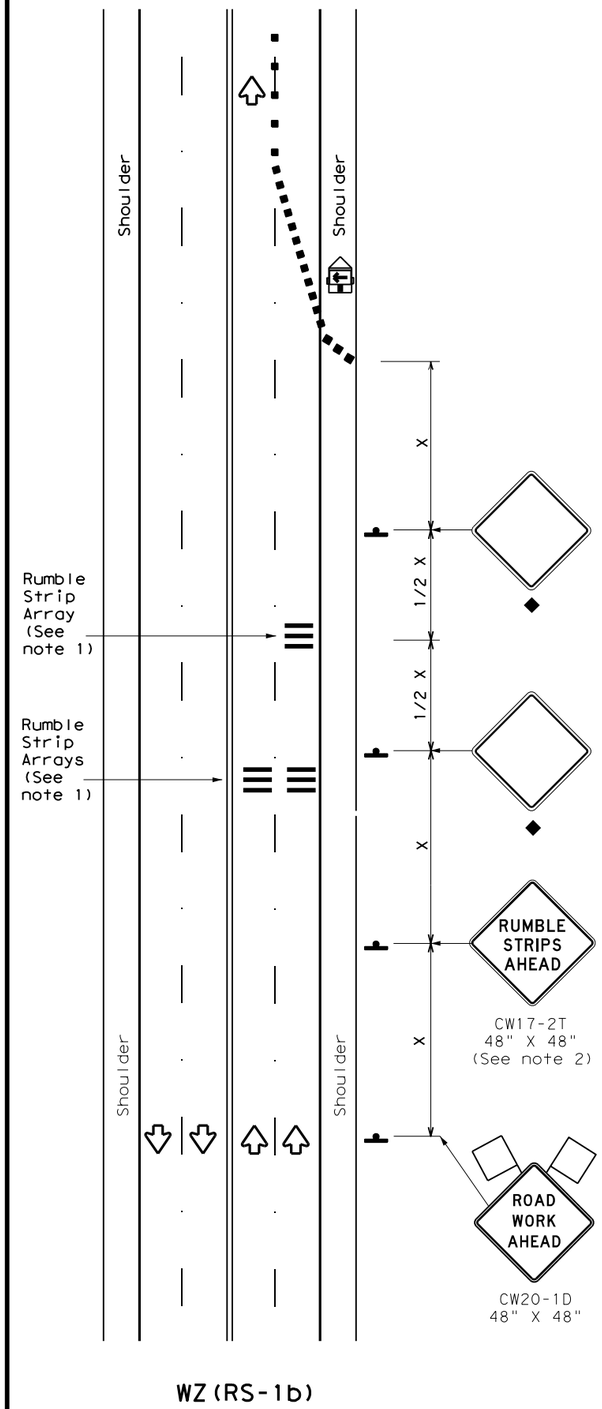
Warning sign and rumble strip sequence in opposite direction is same as below.

TABLE 1		
Flagger to Flagger (Length of Work Area)	ADT	# of Rumble Strip Arrays
1/8 Mile	< 4,500	1
	≥ 4,500	2
1/4 Mile	< 3,500	1
	≥ 3,500	2
1/2 Mile	< 2,600	1
	≥ 2,600	2
1 Mile	< 1,600	1
	≥ 1,600	2
> 1 Mile	N/A	2



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

1. Each Rumble Strip Array should consist of three rumble strips spaced center to center at the spacing shown in Table 2, placed transverse across the lane at locations shown.
2. The CW17-2T "RUMBLE STRIPS AHEAD" sign should be located after the CW20-1D "ROAD WORK AHEAD sign and spaced as shown. If traffic is observed to be queuing, or is expected to queue beyond the Rumble Strips, the CW17-2T sign and the first Rumble Strip Array may be located upstream of the CW20-1D sign as necessary to provide needed warning.
3. Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
4. Remove Temporary Rumble Strips before removing the advanced warning signs.
5. Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
6. Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
7. This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
8. The one-lane two-way application may utilize a flagger, an Automated Flagger Assistance Device (AFAD) or a Portable Traffic Signal (PTS).
9. Replace defective Temporary Rumble Strips as directed by the Engineer.
10. Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment and written direction from the Engineer.

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Panel	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT)
S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

◆ Signs are for illustrative purposes only. Signs required may vary depending on the TCP, TMUTCD Typical Application, or project specific details for the project.

* For posted speeds in excess of 65 MPH, it is recommended that spacing is increased as speed limits increase. Increasing space between rumble strips will improve effectiveness.

TABLE 2	
Speed	Approximate distance between strips in an array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
= 60 MPH	20'
≥ 65 MPH	* 35' +

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-14 1-22 4-16	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		37

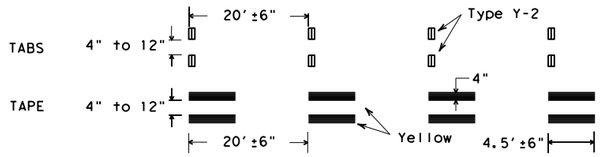
117

DATE: $DATE$ $TIME$
FILE: $FILE$

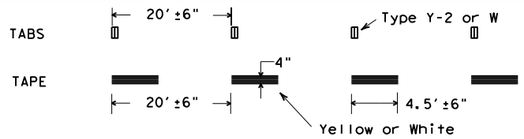
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

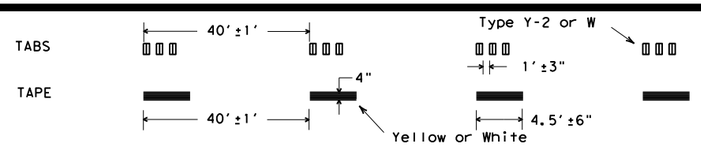


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



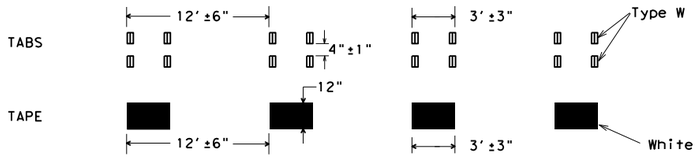
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

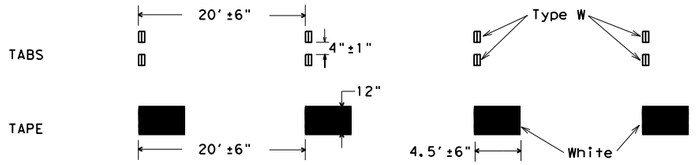


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



NOTES:

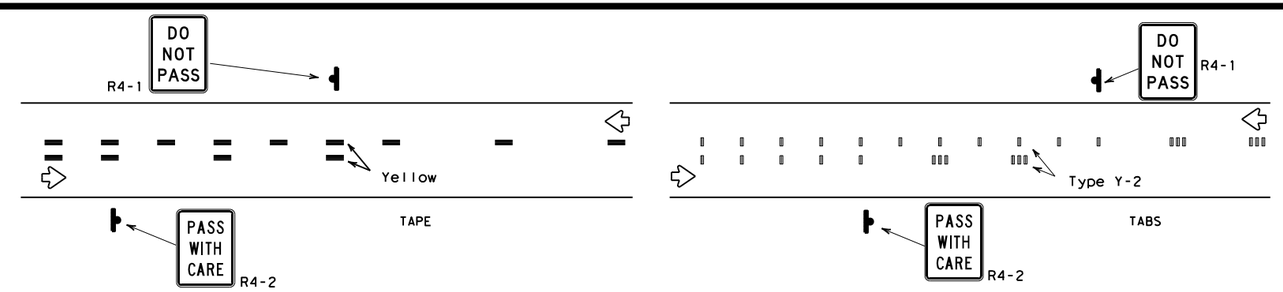
1. Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible-reflective roadway marker tabs unless otherwise specified elsewhere in plans.
2. Short term pavement markings shall NOT be used to simulate edge lines.
3. Dimensions indicated on this sheet are typical and approximate. Variations in size and height may occur between markers or devices made by manufacturers, by as much as 1/4 inch, unless otherwise noted.
4. Temporary flexible-reflective roadway marker tabs will require normal maintenance replacement when used on roadways with an ADT per lane of up to 7500 vehicles with no more than 10% truck mix. When roadways exceed these values, additional maintenance replacement of devices should be planned.
5. No segment of roadway open to traffic shall remain without permanent pavement markings for a period greater than 14 calendar days. The Contractor will be responsible for maintaining short term pavement markings until permanent pavement markings are in place. When the Contractor is responsible for placement of permanent pavement markings, no segment of roadway shall remain without permanent pavement markings for a period greater than 14 calendar days unless weather conditions prohibit placement. Permanent pavement markings shall be placed as soon as weather permits.
6. For two lane, two-way roadways, DO NOT PASS signs shall be erected to mark the beginning of sections where passing is prohibited and PASS WITH CARE signs shall be erected to mark the beginning of sections where passing is permitted. Signs shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and may be used to indicate the limits of no-passing zones for up to 14 calendar days. Permanent pavement markings should then be placed.
7. For low volume two lane, two-way roadways of 4000 ADT or less, no-passing lines may be omitted when approved by the Engineer. DO NOT PASS and PASS WITH CARE signs shall be erected (see note 6).
8. For exit gores where a lane is being dropped place wide gore markings or retroreflective channelizing devices to guide motorist through the exit. If channelizing devices are to be used it should be noted elsewhere in the plans. One piece cones are not allowed for this purpose.

TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

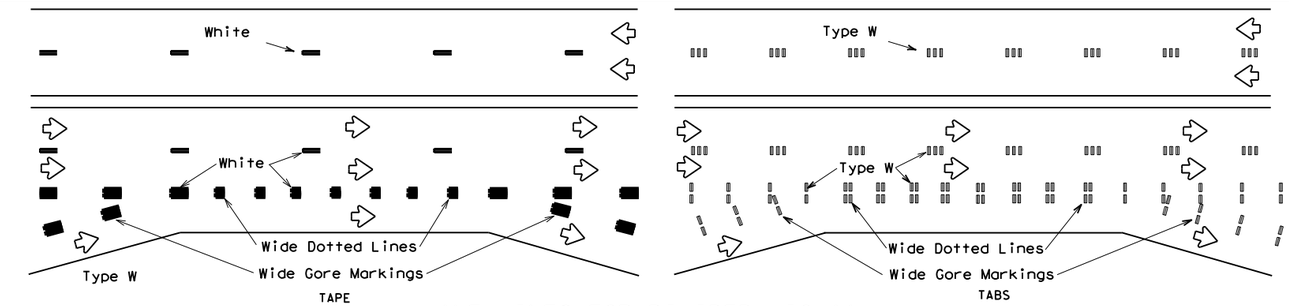
1. Temporary flexible-reflective roadway marker tabs detailed on this sheet will be designated Type Y-2 (two amber reflective surfaces with yellow body); Type Y (one amber reflective surface with yellow body); and Type W (one white or silver reflective surface with white body). Additional details may be found on BC(11).
2. Tabs shall meet requirements of Departmental Material Specification DMS-8242.
3. When dry, tabs shall be visible for a minimum distance of 200 feet during normal daylight hours and when illuminated by automobile low-beam head light at night, unless sight distance is restricted by roadway geometrics.
4. No two consecutive tabs nor four tabs per 1000 feet of line shall be missing or fail to meet the visual performance requirements of Note 3.

DATE: $DATE$ $TIME$
FILE: $FILE$

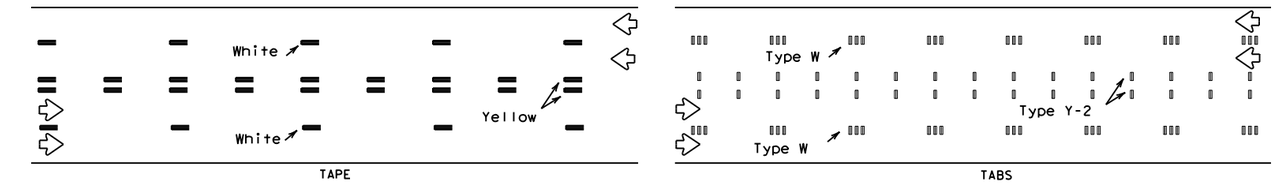
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



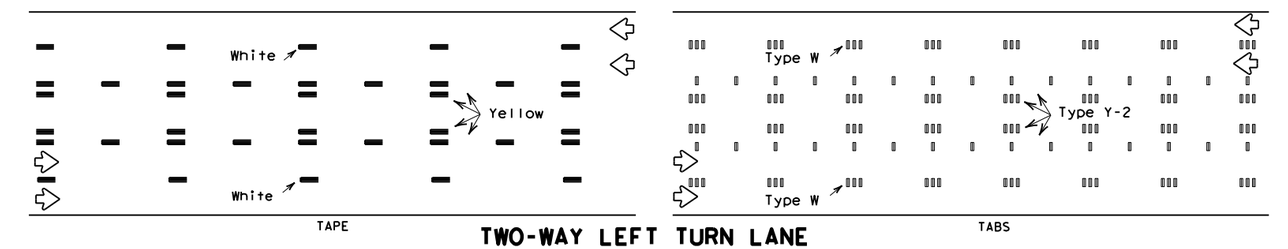
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



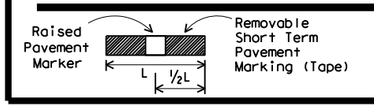
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



If raised pavement markers are used to supplement REMOVABLE short term markings, the markers shall be applied to the top of the tape at the approximate mid length of the tape. This allows an easier removal of raised markers and tape.

PREFABRICATED PAVEMENT MARKINGS

1. Temporary Removable Prefabricated Pavement Markings shall meet the requirements of DMS-8241.
2. Non-removable Prefabricated Pavement Markings shall meet the requirements of either DMS-8240 "Permanent Prefabricated Pavement Markings" or DMS-8243 "Temporary Costruction-Grade Prefabricated Pavement Markings."

RAISED PAVEMENT MARKERS

1. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and DMS-4200.

DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS) & MATERIAL PRODUCER LISTS (MPL)

1. DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:
   http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

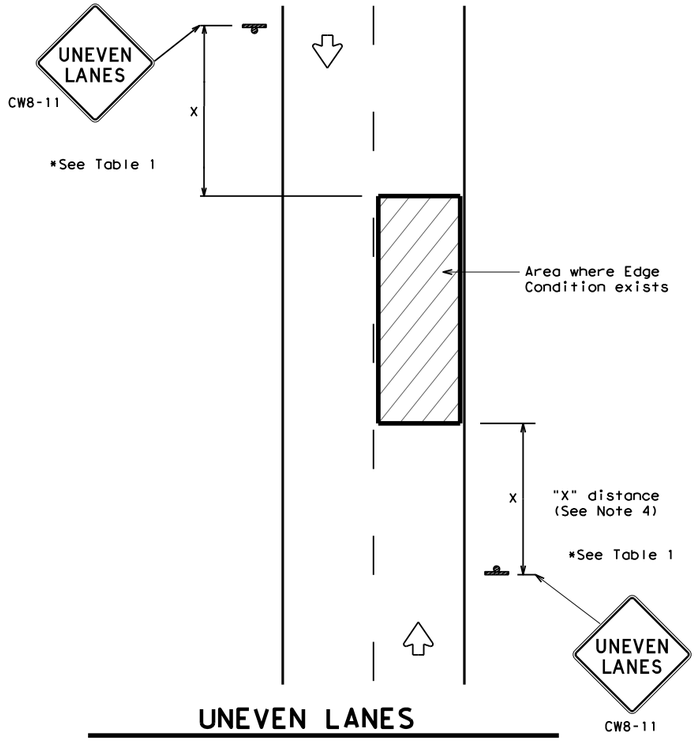
Texas Department of Transportation

Traffic Operations Division Standard

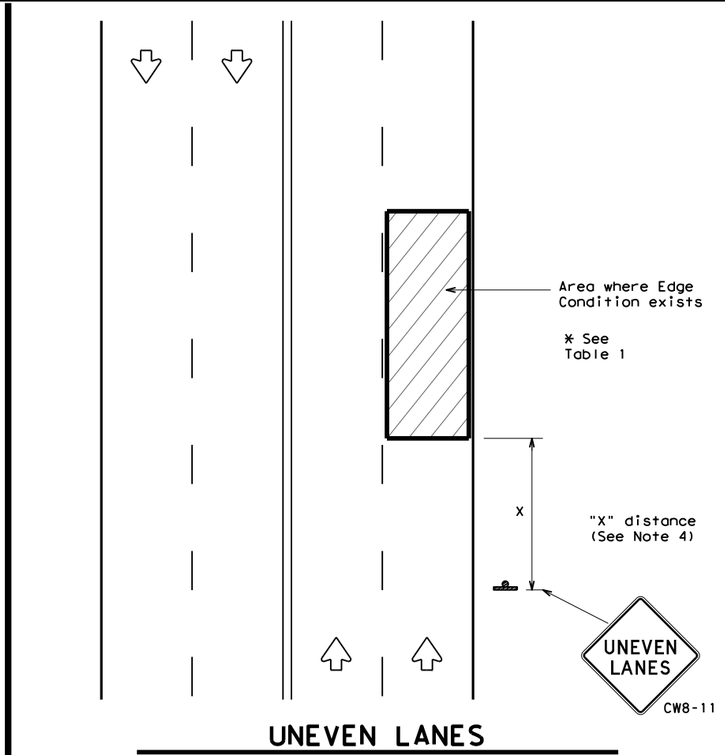
WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

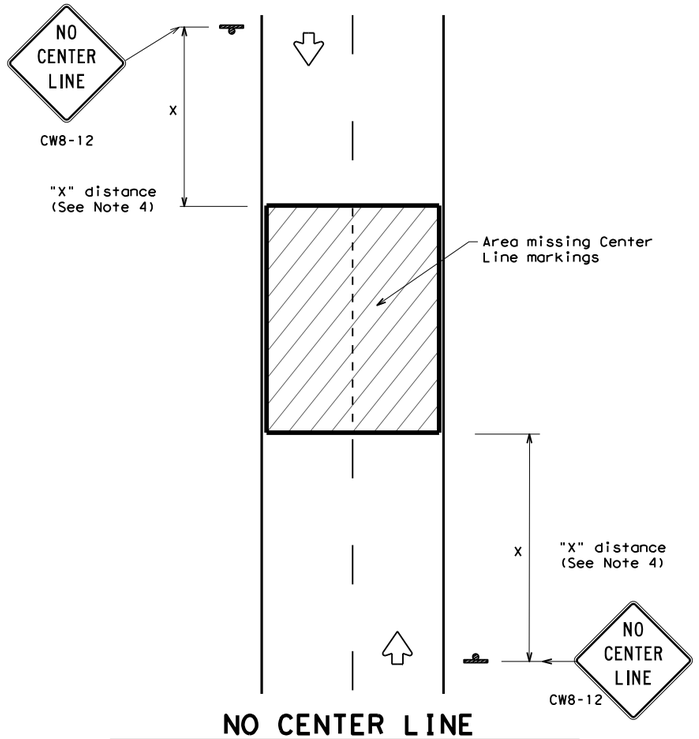
FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		3427	03	007	FM 3356
1-97		DIST	COUNTY		SHEET NO.
3-03		DAL	COLLIN		38
7-13					



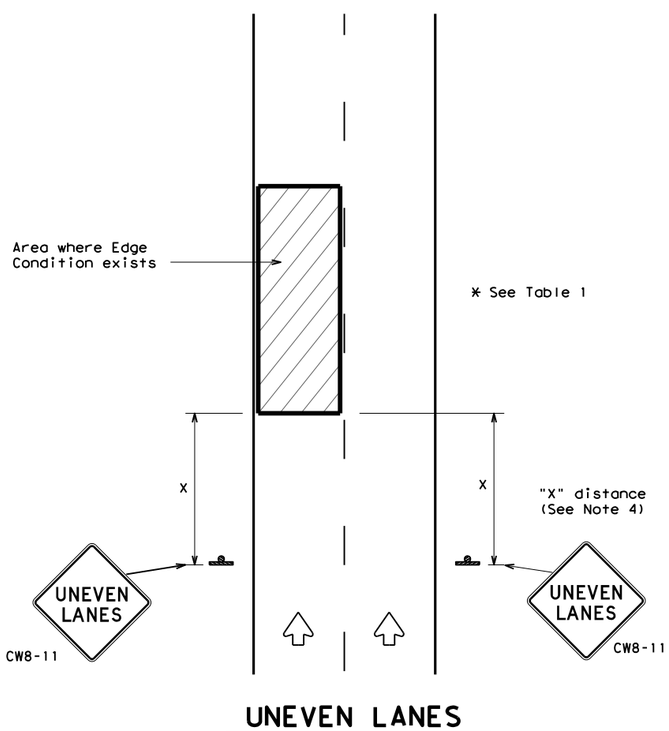
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

DATE: $DATE$ $TIME$
FILE: $FILE$

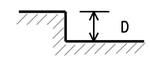
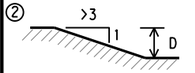
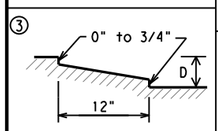
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL} SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

GENERAL NOTES

1. If spalling or holes occur, ROUGH ROAD (CW8-8) signs should be placed in advance of the condition and be repeated every two miles where the condition persists.
2. UNEVEN LANES (CW8-11) signs shall be installed in advance of the condition and repeated every mile. Signs installed along the uneven lane condition may be supplemented with the NEXT XX MILES (CW7-3aP) plaque or Advisory Speed (CW13-1P) plaque.
3. NO CENTER LINE (CW8-12) signs and temporary pavement markings as per the WZ(STPM) standard shall be installed if yellow centerlines separating two way traffic are obscured or obliterated. Repeat NO CENTER LINE signs every two miles where the center line markings are not in place. The signs and markings shall remain in place until permanent pavement markings are installed.
4. Signs shall be spaced at the distances recommended as per BC standards.
5. Additional signs may be required as directed by the Engineer. Signs shall remain in place until final surface is applied. Signs shall be considered subsidiary to Item 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING."
6. Signs shall be fabricated and mounted on supports as shown on the BC standards and/or listed on the "Compliant Work Zone Traffic Control Devices" list.
7. Short term markings shall not be used to simulate edge lines.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition.

TABLE 1

Edge Condition	Edge Height (D)	* Warning Devices
① 	Less than or equal to: 1¼" (maximum-planing) 1½" (typical-overlay)	Sign: CW8-11
	Distance "D" may be a maximum of 1 1/4 " for planing operations and 2" for overlay operations if uneven lanes with edge condition 1 are open to traffic after work operations cease.	
② 	Less than or equal to 3"	Sign: CW8-11
③  Notched Wedge Joint	Distance "D" may be a maximum of 3" if uneven lanes with edge condition 2 or 3 are open to traffic after work operations cease. Uneven lanes should not be open to traffic when "D" is greater than 3".	

TRAFFIC CONTROL DURING PLANING, OVERLAY AND LEVELING OPERATIONS ARE SHOWN ELSEWHERE IN THE PLANS.

MINIMUM WARNING SIGN SIZE	
Conventional roads	36" x 36"
Freeways/expressways, divided roadways	48" x 48"

Texas Department of Transportation

Traffic Operations Division Standard

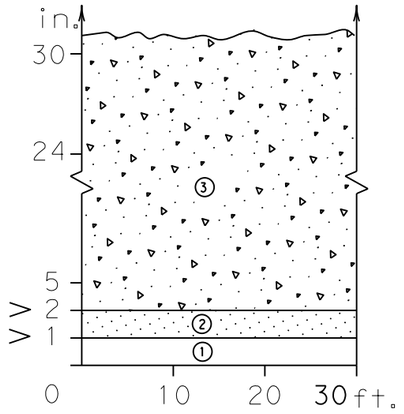
SIGNING FOR UNEVEN LANES

WZ(UL)-13

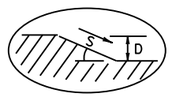
FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	DAL	COLLIN		39

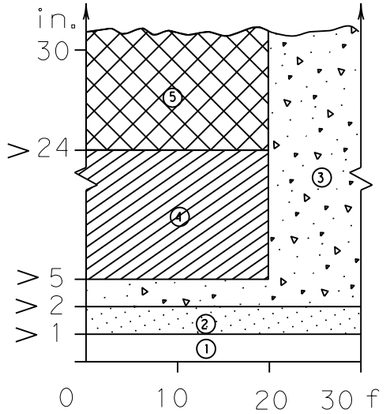
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet

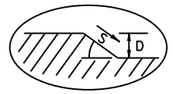


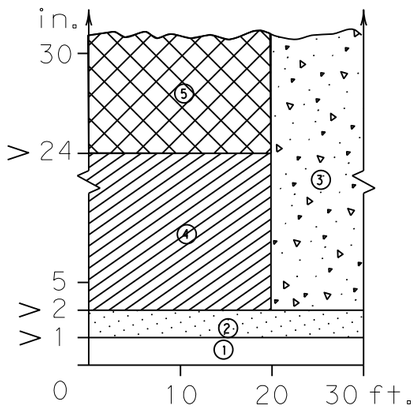
Edge Condition I
S = (3:1) (or flatter)



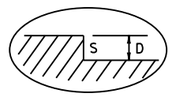


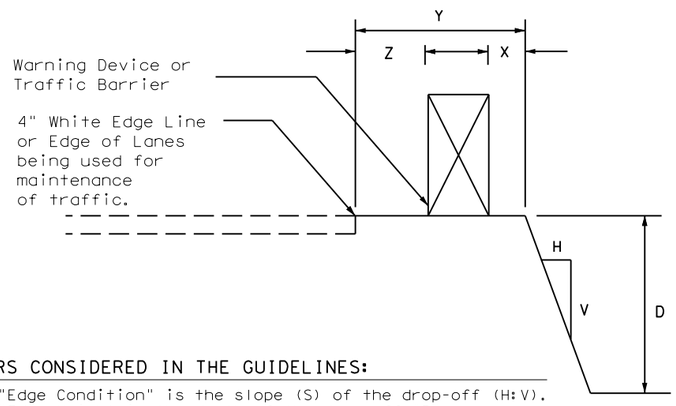
Edge Condition II
S = ((2.99):1) to (1:1)





Edge Condition III
S is steeper than (1:1)





FACTORS CONSIDERED IN THE GUIDELINES:

1. The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height is the depth of the drop-off "D".

2. Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.

3. In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.

4. The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.

5. If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8 sign), or 2) provide an edge slope such as Edge Condition I.

Zone	Treatment Types Guidelines:
①	No treatment
②	CW 8-11 "Uneven Lanes" signs.
③	CW 8-9a Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
④	CW8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge slope to that of the profered Edge Condition I.
⑤	Check indications (Figure-1) for possitive barrier. Where positive barrier is not indicated, the treatment shown above for Zone-4 may be used after consideration of other applicable factors.

Edge Condition Notes:

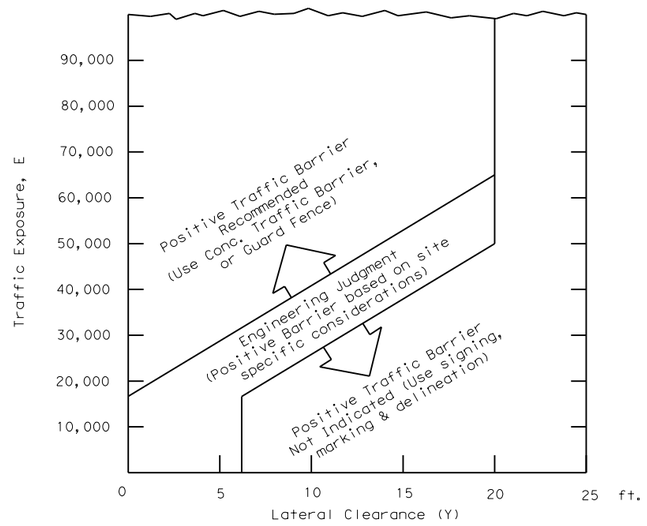
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

2. Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1 to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" exeeds 24 inches, the possibility for rollover is greater in most vehicles.

3. Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, particularly those with high loads, have more steering control differential when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.

4. Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 (▨)



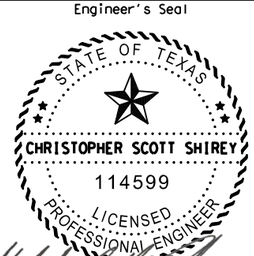
1. E = ADT x T
Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.

2. Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.

3. An approved end treatment should be provided for any positive barrier end located within the clear zone.

These guidelines apply to temporary traffic control areas or work zones where continuous pavement edges or drop-offs exists parallel and adjacent to a lane used by traffic. The edge conditions may be present between shoulders and travel lanes, between adjacent or opposing travel lanes, or at intermediate points across the width of the paved surface. Due to the variability in construction operations, tolerances in the variables may be allowed by the engineer. These guidelines do not apply to short term operations. These guidelines do not constitute a rigid standard or policy; rather, they are guidance to be used in conjunction with engineering judgement. These guidelines may be updated on the Design Division's on-line manuals.

Engineer's Seal



02/03/2023

Texas Department of Transportation

Traffic Safety Division Standard

TREATMENT FOR VARIOUS EDGE CONDITIONS

FILE: edgecon.dgn	DN:	CK:	DW:	CK:
©TxDOT August 2000	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
03-01 08-01 9-21	DIST	COUNTY		SHEET NO.
	DAL	Collin		40

DATE: 2023/01/06
FILE: DOCUMENT NAME

ALIGNMENT NAME: FM 3356
ALIGNMENT DESCRIPTION:
ALIGNMENT STYLE:

ELEMENT: LINEAR			
POB	0+00.0000	7184521.3	2537867.535
PC	0+99.0861	7184620.4	2537869.301
TANGENTIAL DIRECTION:	N 1.0 E		
TANGENTIAL LENGTH:	99.0861		
ELEMENT: CIRCULAR			
PC	0+99.0861	7184620.4	2537869.301
PI	3+57.0258	7184878.3	2537873.9
CC		7184578.46	2540222.572
PT	6+12.9149	7185129.1	2537934.245
RADIUS:	2353.6452		
DELTA:	12.5	RIGHT	
DEGREE OF CURVATURE (ARC):	2.4		
LENGTH:	513.8287		
TANGENT:	257.9396		
CHORD:	512.809		
MIDDLE ORDINATE:	14.0079		
EXTERNAL:	14.0918		
TANGENT DIRECTION:	N 1.0 E		
RADIAL DIRECTION:	S 89.0 E		
CHORD DIRECTION:	N 7.3 E		
RADIAL DIRECTION:	S 76.5 E		
TANGENT DIRECTION:	N 13.5 E		
ELEMENT: LINEAR			
PT	6+12.9149	7185129.1	2537934.245
PC	19+86.428	7186464.4	2538255.581
TANGENTIAL DIRECTION:	N 13.5 E		
TANGENTIAL LENGTH:	1373.5131		
ELEMENT: CIRCULAR			
PC	19+86.428	7186464.4	2538255.581
PI	23+58.997	7186826.7	2538342.744
CC		7186735.7	2537128.399
PT	27+07.396	7187171.9	2538202.571
RADIUS:	1159.3562		
DELTA:	35.6	LEFT	
DEGREE OF CURVATURE (ARC):	4.9		
LENGTH:	720.9689		
TANGENT:	372.5693		
CHORD:	709.4076		
MIDDLE ORDINATE:	55.5935		
EXTERNAL:	58.3936		
TANGENT DIRECTION:	N 13.5 E		
RADIAL DIRECTION:	S 76.5 E		
CHORD DIRECTION:	N 4.3 W		
RADIAL DIRECTION:	N 67.9 E		
TANGENT DIRECTION:	N 22.1 W		
ELEMENT: LINEAR			
PT	27+07.396	7187171.9	2538202.571
PC	33+84.964	7187799.6	2537947.51
TANGENTIAL DIRECTION:	N 22.1 W		
TANGENTIAL LENGTH:	677.5677		
ELEMENT: LINEAR			
PT	33+84.964	7187799.6	2537947.51
PC	40+62.532	7188427.3	2537692.448
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TANGENTIAL LENGTH:	677.5677		
ELEMENT: CIRCULAR			
PC	40+62.532	7188427.3	2537692.448
PI	41+77.766	7188534.1	2537649.07
CC		7192255.8	2547114.701
PT	42+92.990	7188641.8	2537608.122
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LENGTH:	230.4586		
TANGENT:	115.2342		
CHORD:	230.4536		
MIDDLE ORDINATE:	0.6528		
EXTERNAL:	0.6528		
TANGENT DIRECTION:	N 22.1 W		
RADIAL DIRECTION:	N 67.9 E		
CHORD DIRECTION:	N 21.5 W		
RADIAL DIRECTION:	N 69.2 E		
TANGENT DIRECTION:	N 20.8 W		
ELEMENT: LINEAR			
PT	42+92.990	7188641.8	2537608.122
PC	52+52.118	7189538.3	2537267.296
TANGENTIAL DIRECTION:	N 20.8 W		
TANGENTIAL LENGTH:	959.1277		
ELEMENT: CIRCULAR			
PC	52+52.118	7189538.3	2537267.296
PI	56+17.570	7189879.9	2537137.434
CC		7190208.3	2539029.659
PT	59+74.070	7190245.3	2537144.607
RADIUS:	1885.4158		
DELTA:	21.9	RIGHT	
DEGREE OF CURVATURE (ARC):	3		
LENGTH:	721.9516		
TANGENT:	365.452		
CHORD:	717.549		
MIDDLE ORDINATE:	34.4502		
EXTERNAL:	35.0914		
TANGENT DIRECTION:	N 20.8 W		
RADIAL DIRECTION:	N 69.2 E		
CHORD DIRECTION:	N 9.8 W		
RADIAL DIRECTION:	S 88.9 E		
TANGENT DIRECTION:	N 1.1 E		
ELEMENT: LINEAR			
PT	59+74.070	7190245.3	2537144.607
PI	76+22.871	7191893.8	2537176.797
TANGENTIAL DIRECTION:	N 1.1 E		
TANGENTIAL LENGTH:	1648.8016		
ELEMENT: CIRCULAR			
PC	76+22.871	7191893.8	2537176.797
PI	78+39.177	7192110.1	2537181.02
CC		7191807.05	2541621.533
PT	80+55.141	7192324.9	2537206.219
RADIUS:	4445.5834		
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LENGTH:	432.2703		
TANGENT:	216.3056		
CHORD:	432.1		
MIDDLE ORDINATE:	5.253		
EXTERNAL:	5.2592		
TANGENT DIRECTION:	N 1.1 E		
RADIAL DIRECTION:	S 88.9 E		
CHORD DIRECTION:	N 3.9 E		
RADIAL DIRECTION:	S 83.3 E		
TANGENT DIRECTION:	N 6.7 E		
ELEMENT: LINEAR			
PT	80+55.141	7192324.9	2537206.219
PC	102+27.40	7194482.4	2537459.278
TANGENTIAL DIRECTION:	N 6.7 E		
TANGENTIAL LENGTH:	2172.2672		
ELEMENT: CIRCULAR			
PC	102+27.40	7194482.4	2537459.278
PI	104+15.33	7194669.0	2537481.17
CC		7197069.8	2515400.154
PT	106+03.25	7194856.0	2537499.901
RADIUS:	22210.3496		
DELTA:	1	LEFT	
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LENGTH:	375.8421		
TANGENT:	187.9255		
CHORD:	375.8376		
MIDDLE ORDINATE:	0.795		
EXTERNAL:	0.795		
TANGENT DIRECTION:	N 6.7 E		
RADIAL DIRECTION:	S 83.3 E		
CHORD DIRECTION:	N 6.2 E		
RADIAL DIRECTION:	S 84.3 E		
TANGENT DIRECTION:	N 5.7 E		
ELEMENT: LINEAR			
PT	106+03.25	7194856.0	2537499.901
PC	115+43.40	7195791.532	2537593.61
TANGENTIAL DIRECTION:	N 5.7 E		
TANGENTIAL LENGTH:	940.1583		
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PI	117+31.80	7195978.9	2537612.387
CC		7196188.7	2533627.929
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CHORD:	376.3654		
MIDDLE ORDINATE:	4.4451		
EXTERNAL:	4.4501		
TANGENT DIRECTION:	N 5.7 E		
RADIAL DIRECTION:	S 84.3 E		
CHORD DIRECTION:	N 3.0 E		
RADIAL DIRECTION:	S 89.7 E		
TANGENT DIRECTION:	N 0.3 E		
ELEMENT: LINEAR			
PT	119+19.91	7196167.3	2537613.399
PC	129+79.15	7197226.6	2537619.088
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TANGENTIAL LENGTH:	1059.2439		
ELEMENT: CIRCULAR			
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CC		7197270.3	2529472.251
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CHORD:	21.9063		
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EXTERNAL:	0.0074		
TANGENT DIRECTION:	N 0.3 E		
RADIAL DIRECTION:	S 89.7 E		
CHORD DIRECTION:	N 0.2 E		
RADIAL DIRECTION:	S 89.8 E		
TANGENT DIRECTION:	N 0.2 E		

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

FM 3356
HORIZONTAL ALIGNMENT DATA

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	41
	3427	03	007	

ALIGNMENT NAME:	FM 3356		
ALIGNMENT DESCRIPTION:			
ALIGNMENT STYLE:			
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PC	133+87.66	37197635.1	2537620.212
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TANGENTIAL LENGTH:	386.5978		
ELEMENT: CIRCULAR			
PC	133+87.66	37197635.1	2537620.212
PI	139+20.66	7198168.1	2537621.642
CC		7197637.6	2536674.206
PT	143+58.43	7198445.4	2537166.492
RADIUS:	946.0097		
DELTA:	58.8	LEFT	
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TANGENT:	533.0035		
CHORD:	928.7392		
MIDDLE ORDINATE:	121.816		
EXTERNAL:	139.8204		
TANGENT DIRECTION:	N 0.2 E		
RADIAL DIRECTION:	S 89.8 E		
CHORD DIRECTION:	N 29.2 W		
RADIAL DIRECTION:	N 31.4 E		
TANGENT DIRECTION:	N 58.6 W		
ELEMENT: LINEAR			
PT	143+58.43	7198445.4	2537166.492
PC	147+84.51	7198668.4	2536803.44
TANGENTIAL DIRECTION:	N 58.4 W		
TANGENTIAL LENGTH:	426.0786		
ELEMENT: CIRCULAR			
PC	147+84.51	7198668.4	2536803.44
PI	148+98.59	7198728.202	536706.234
CC		7199674.342	537421.315
PT	150+11.97	7198805.422	536622.262
RADIUS:	1180.4693		
DELTA:	11	RIGHT	
DEGREE OF CURVATURE (ARC):	4.9		
LENGTH:	227.4543		
TANGENT:	114.0803		
CHORD:	227.1026		
MIDDLE ORDINATE:	5.474		
EXTERNAL:	5.4995		
TANGENT DIRECTION:	N 58.4 W		
RADIAL DIRECTION:	N 31.6 E		
CHORD DIRECTION:	N 52.9 W		
RADIAL DIRECTION:	N 42.6 E		
TANGENT DIRECTION:	N 47.4 W		
ELEMENT: LINEAR			
PT	150+11.97	7198805.422	536622.262
PC	150+64.60	7198841.0	2536583.52
TANGENTIAL DIRECTION:	N 47.4 W		
TANGENTIAL LENGTH:	52.6329		

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

FM 3356
HORIZONTAL ALIGNMENT DATA

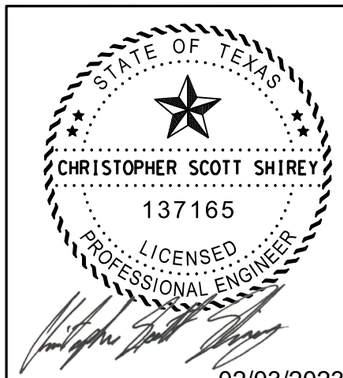
SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS: CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK: MS	TEXAS	DALLAS	COLLIN	
CHECK: JRV	CONTROL	SECTION	JOB	42
	3427	03	007	

VERTICAL CURVE INFORMATION								
VPI	ELEVATION (FT)	G1 (%)	G2 (%)	A	L (FT)	K	CREST/SAG	DESIGN SPEED (MPH)
10+94.50	662.03	2.36	0.69	1.67	295.49	177	CREST	40
18+44.50	667.18	0.69	-2.08	2.77	409.04	148	CREST	40
25+25.77	653.01	-2.08	1.06	3.14	456.42	145	SAG	40
32+68.18	660.91	1.06	-0.88	1.94	277.05	143	CREST	40
38+67.68	655.63	-0.88	2.41	3.29	424.55	129	SAG	40
45+43.18	671.92	2.41	-1.11	3.52	460.90	131	CREST	40
55+27.30	660.97	-1.11	1.01	2.12	486.77	230	SAG	40
67+35.27	673.14	1.01	-1.37	2.38	441.64	186	CREST	40
73+38.38	664.9	-1.37	1.56	2.93	664.90	227	SAG	40
80+70.19	676.34	1.56	-0.50	2.06	306.86	149	CREST	40
84+87.69	675.56	-0.50	3.41	3.91	504.69	129	SAG	40
96+17.95	712.77	3.41	-1.49	4.90	818.48	167	CREST	40
103.+69.78	701.55	-1.49	2.34	3.83	494.27	129	SAG	40
114+71.06	727.34	2.34	-0.23	2.57	808.37	315	CREST	40
133+25.69	723.13	-0.23	1.62	1.85	1215.75	657	SAG	40
143+98.90	740.47	1.62	-1.75	3.37	799.63	237	CREST	40

Superelevation Information											
PI	PC	W	L	0.8L	0.2L	BEGIN SUPER TRANSISTION	END SUPER TRANSISTION BEGIN FULL SUPER	PT	BEGIN SUPER TRANSISTION END FULL SUPER	END SUPER TRANSISTION	SUPER ELEVATION (%)
3+57	0+99	11	17	14	3	0+85	1+03	6+13	6+09	6+27	-2.9
23+59	19+86	11	48	39	10	19+48	19+96	27+07	26+98	27+46	4.5
56+18	52+52	11	27	22	5	52+31	52+58	59+74	59+69	59+96	-3.4
139+21	133+88	11	133	107	27	132+81	134+14	143+58	143+32	144+65	4.9
148+99	147+85	11	46	37	9	147+47	147+94	150+12	150+03	150+49	-4.4

* Superelevation length based on e=6%

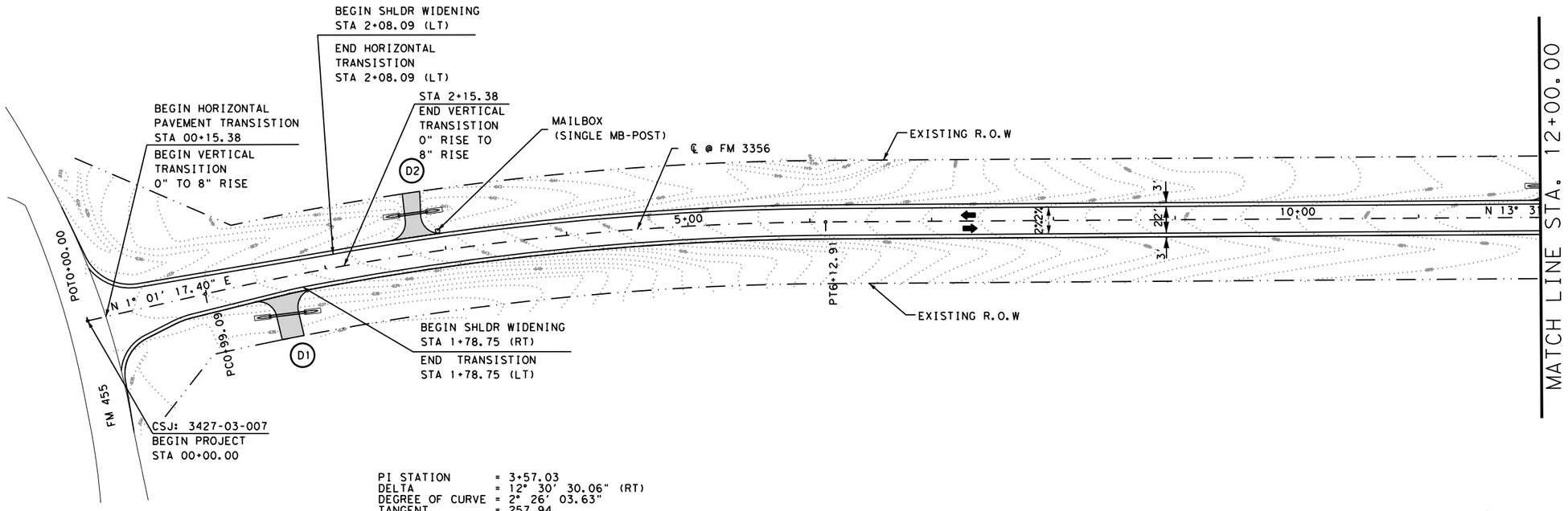


Texas Department of Transportation

FM 3356
VERTICAL ALIGNMENT DATA & SUPERELEVATION TABLE

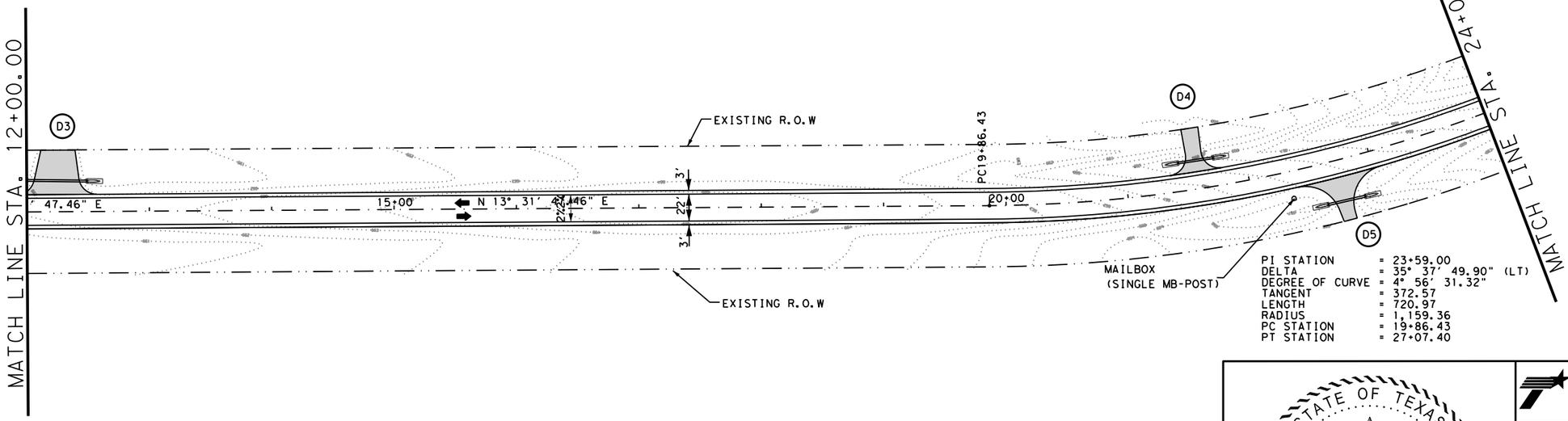
SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS: CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK: MS	TEXAS	DALLAS	COLLIN	
CHECK: JRV	CONTROL	SECTION	JOB	43
	3427	03	007	



PI STATION = 3+57.03
DELTA = 12° 30' 30.06" (RT)
DEGREE OF CURVE = 2° 26' 03.63"
TANGENT = 257.94
LENGTH = 513.83
RADIUS = 2,353.65
PC STATION = 0+99.09
PT STATION = 6+12.91

0 50 100
SCALE: 1" = 100'



PI STATION = 23+59.00
DELTA = 35° 37' 49.90" (LT)
DEGREE OF CURVE = 4° 56' 31.32"
TANGENT = 372.57
LENGTH = 720.97
RADIUS = 1,159.36
PC STATION = 19+86.43
PT STATION = 27+07.40

0 50 100
SCALE: 1" = 100'

NOTES:
1. SEE TYPICAL SECTIONS SHEETS FOR ADDITIONAL INFORMATION.
2. SEE HORIZONTAL & VERTICAL ALIGNMENT & SUPER-ELEVATION DATA.
3. SEE MISCELLANEOUS ROADWAY DETAILS SHEET FOR PAVEMENT TRANSITION DETAILS.
4. SEE DRIVEWAY SUMMARY FOR MORE DETAIL.

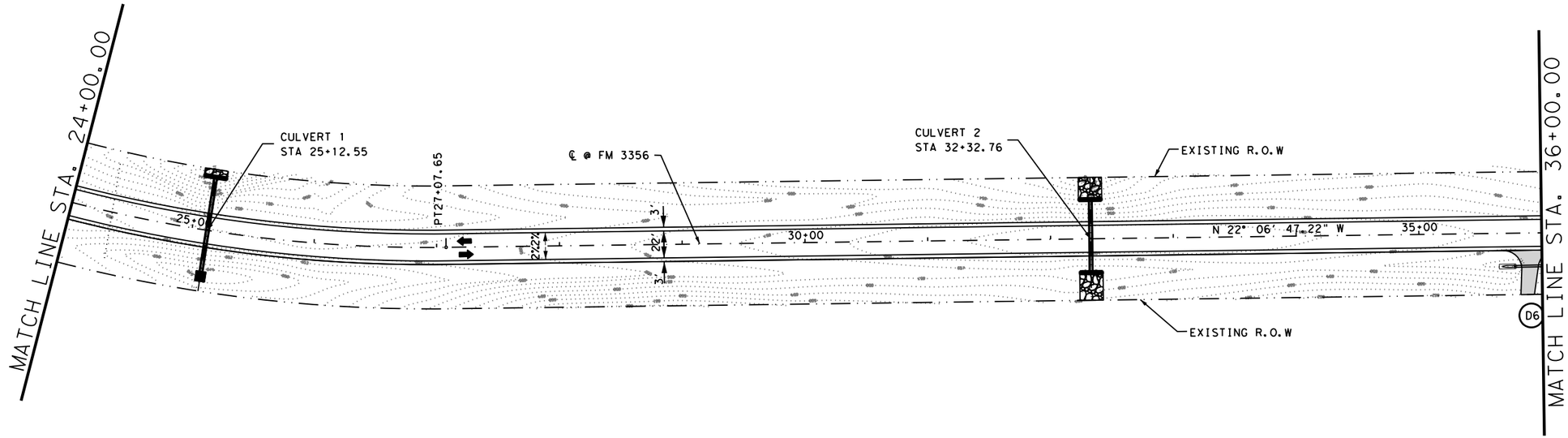
STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

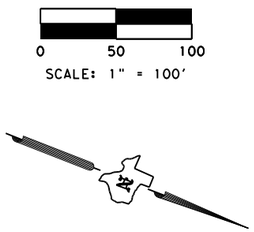
Texas Department of Transportation

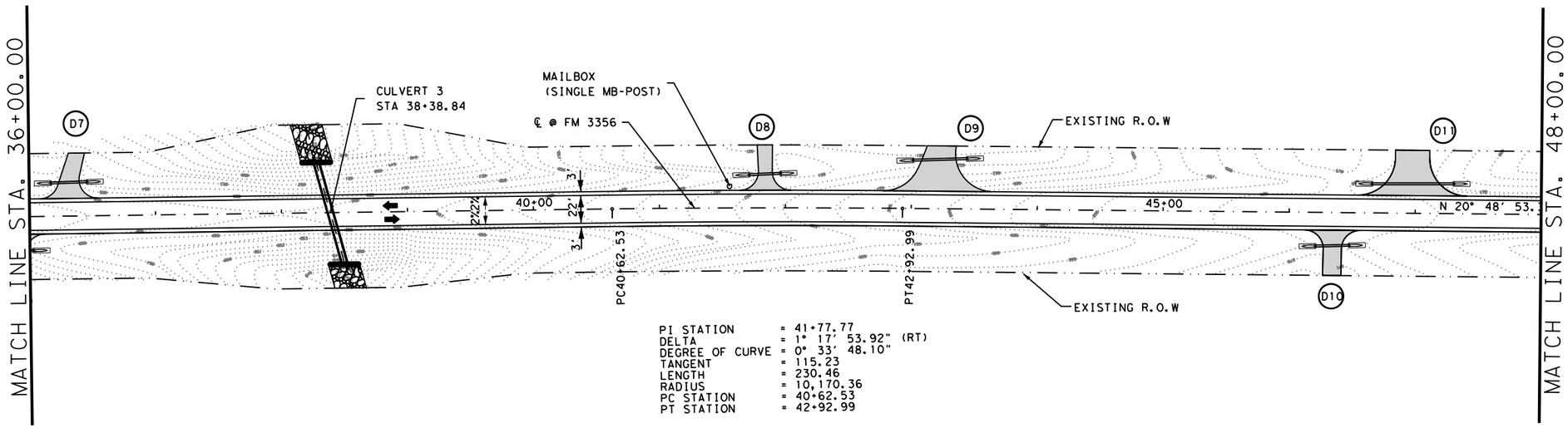
FM 3356
ROADWAY PLAN
STA 0+00 TO 24+00

SHEET 1 OF 7

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	44
	3427	03	007	

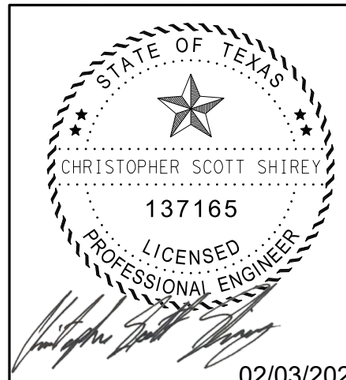






PI STATION = 41+77.77
DELTA = 1° 17' 53.92" (RT)
DEGREE OF CURVE = 0° 33' 48.10"
TANGENT = 115.23
LENGTH = 230.46
RADIUS = 10,170.36
PC STATION = 40+62.53
PT STATION = 42+92.99

NOTES:
1. SEE TYPICAL SECTIONS SHEETS FOR ADDITIONAL INFORMATION.
2. SEE HORIZONTAL & VERTICAL ALIGNMENT & SUPER-ELEVATION DATA.
3. SEE MISCELLANEOUS ROADWAY DETAILS SHEET FOR PAVEMENT TRANSITION DETAILS.
4. SEE DRIVEWAY SUMMARY FOR MORE DETAIL.

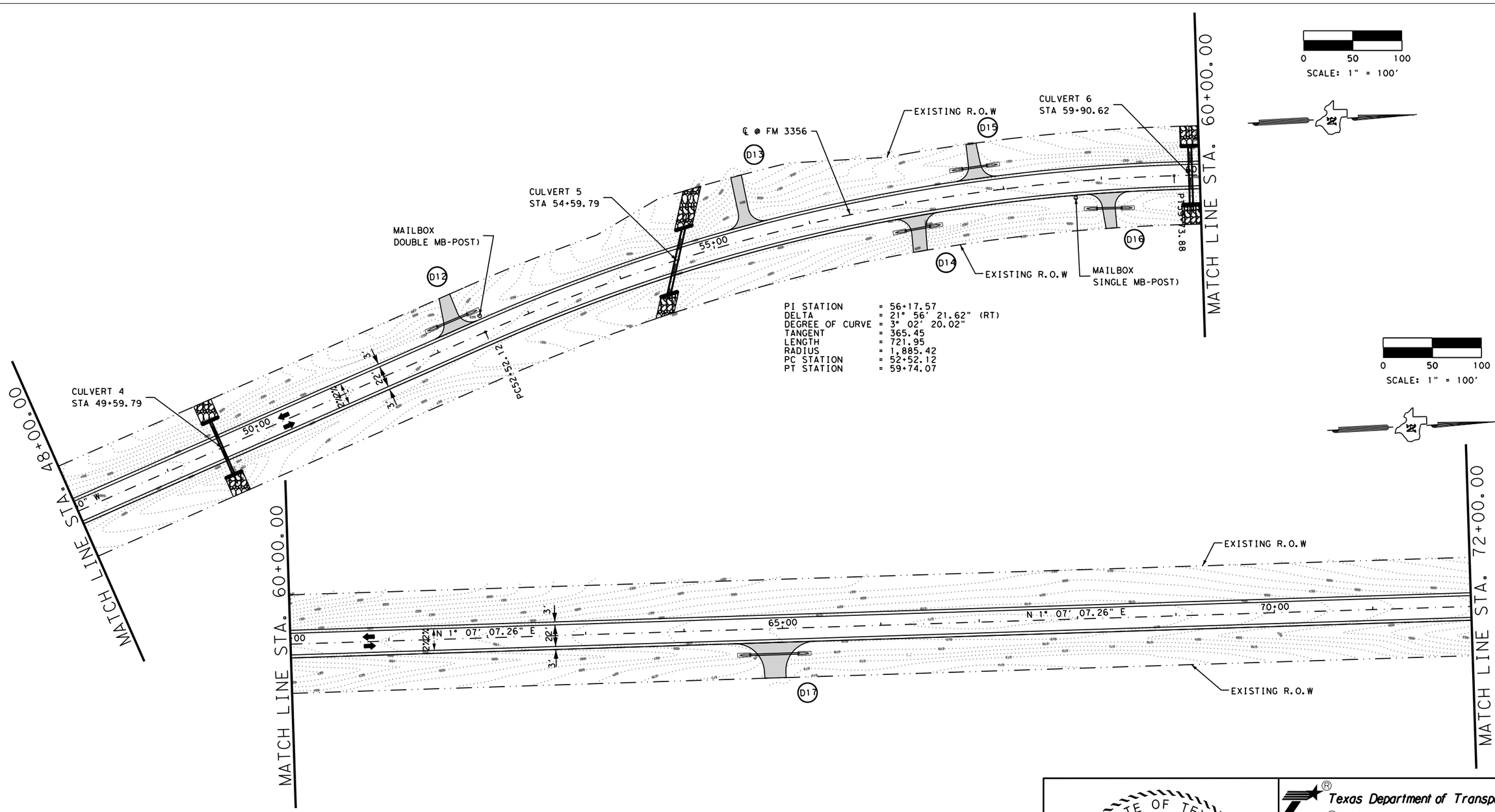


Texas Department of Transportation

FM 3356
ROADWAY PLAN
FM 24+00 TO 48+00

SHEET 2 OF 7

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS: CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK: MS	TEXAS	DALLAS	COLLIN	
CHECK: JRV	CONTROL	SECTION	JOB	45
	3427	03	007	



NOTES:
1. SEE TYPICAL SECTIONS SHEETS FOR ADDITIONAL INFORMATION.
2. SEE HORIZONTAL & VERTICAL ALIGNMENT & SUPER-ELEVATION DATA.
3. SEE MISCELLANEOUS ROADWAY DETAILS SHEET FOR PAVEMENT TRANSITION DETAILS.
4. SEE DRIVEWAY SUMMARY FOR MORE DETAIL.

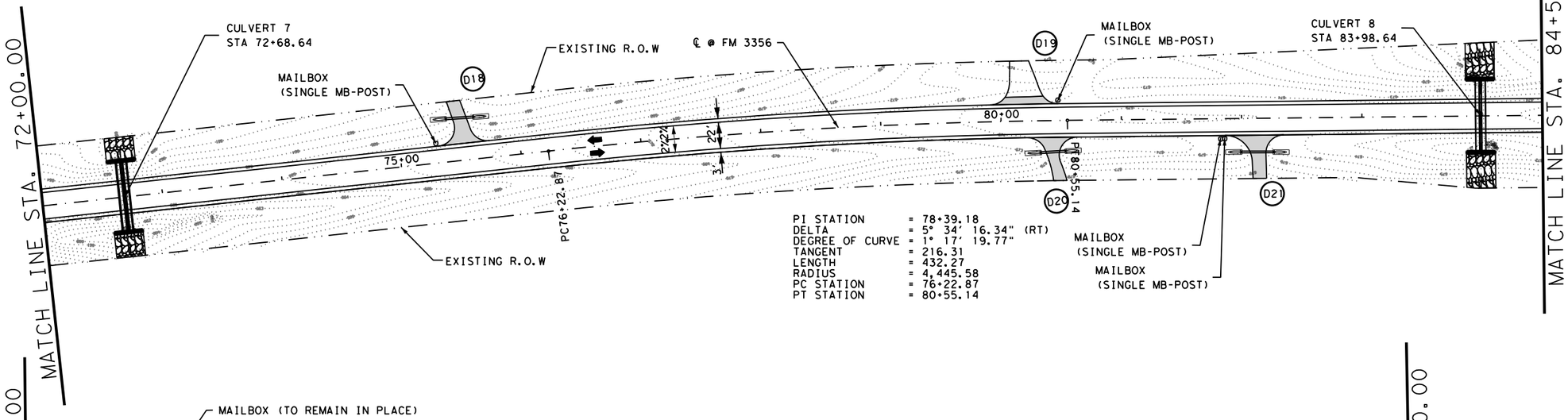
STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

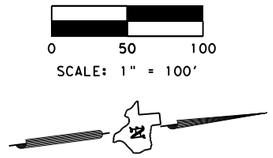
Texas Department of Transportation

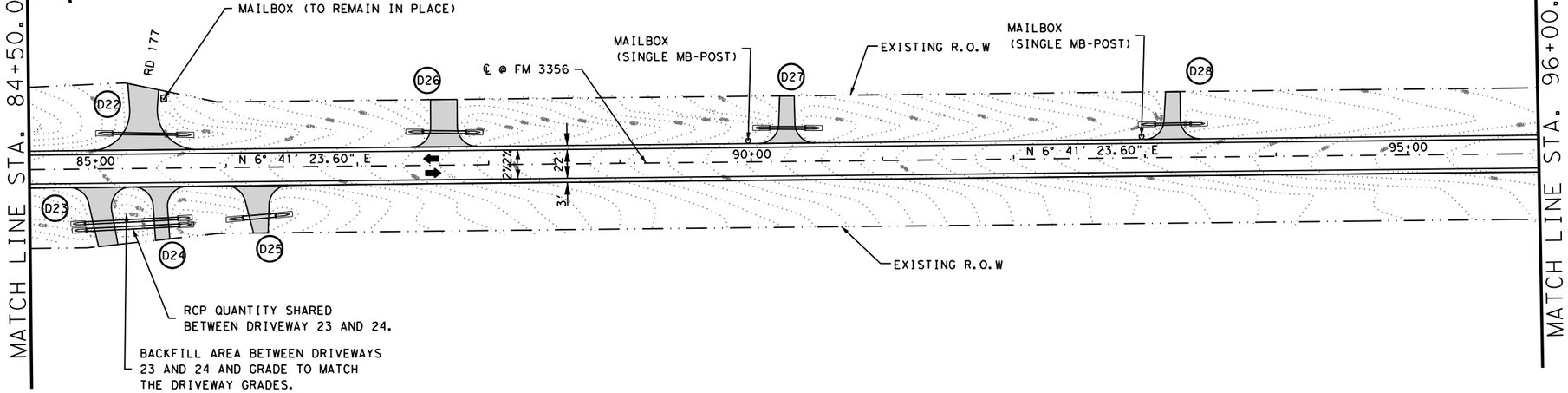
FM 3356
ROADWAY PLAN
STA 48+00 TO 72+00

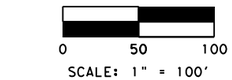
SHEET 3 OF 7

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	46
	3427	03	007	









NOTES:
1. SEE TYPICAL SECTIONS SHEETS FOR ADDITIONAL INFORMATION.
2. SEE HORIZONTAL & VERTICAL ALIGNMENT & SUPER-ELEVATION DATA.
3. SEE MISCELLANEOUS ROADWAY DETAILS SHEET FOR PAVEMENT TRANSITION DETAILS.
4. SEE DRIVEWAY SUMMARY FOR MORE DETAIL.

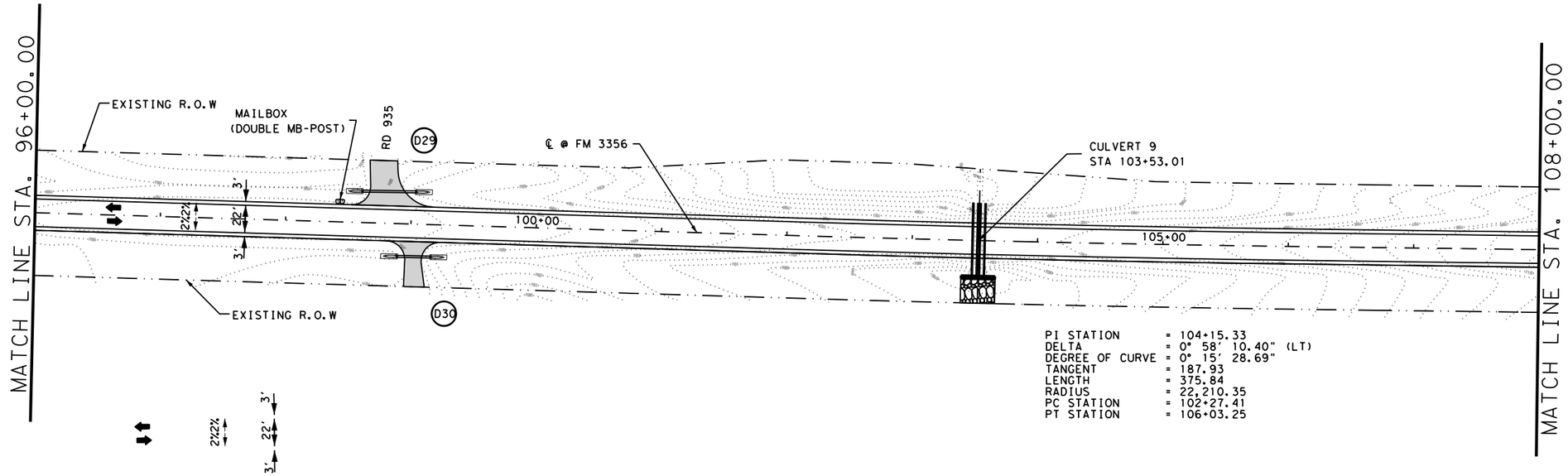
STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

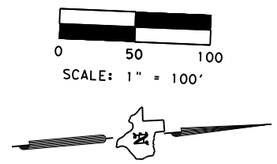
Texas Department of Transportation

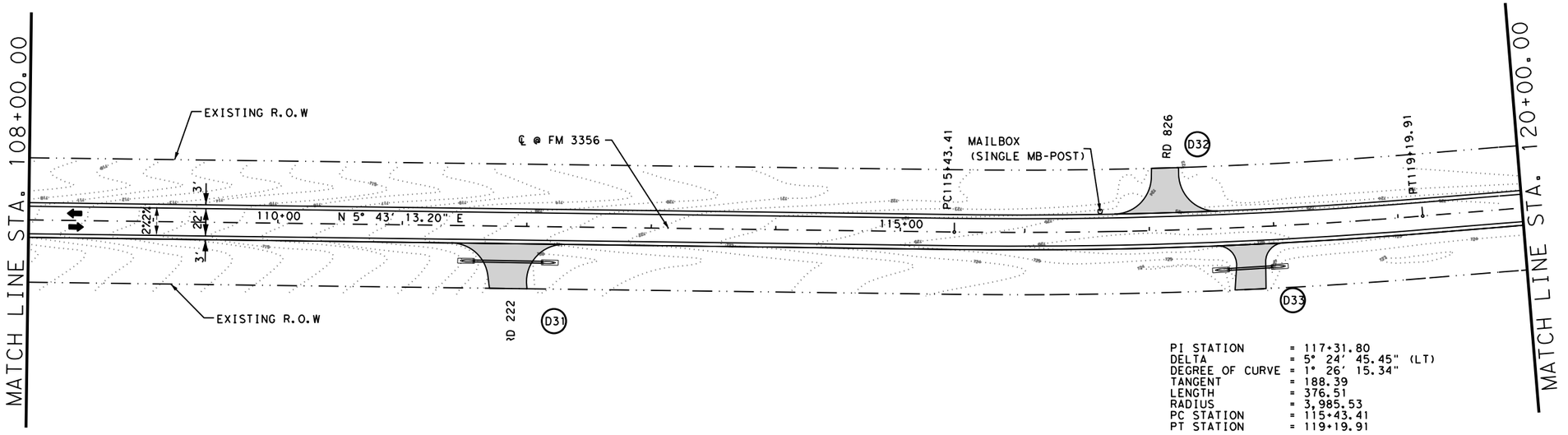
FM 3356
ROADWAY PLAN
STA 72+00 TO 96+00

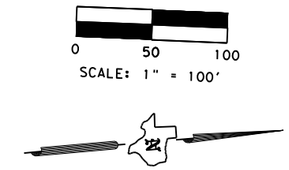
SHEET 4 OF 7

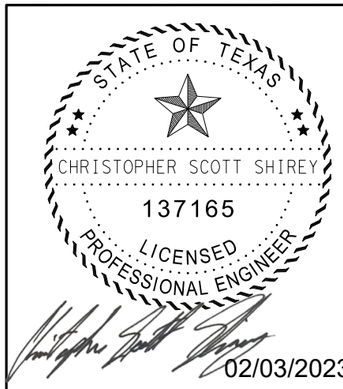
DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	47
	3427	03	007	











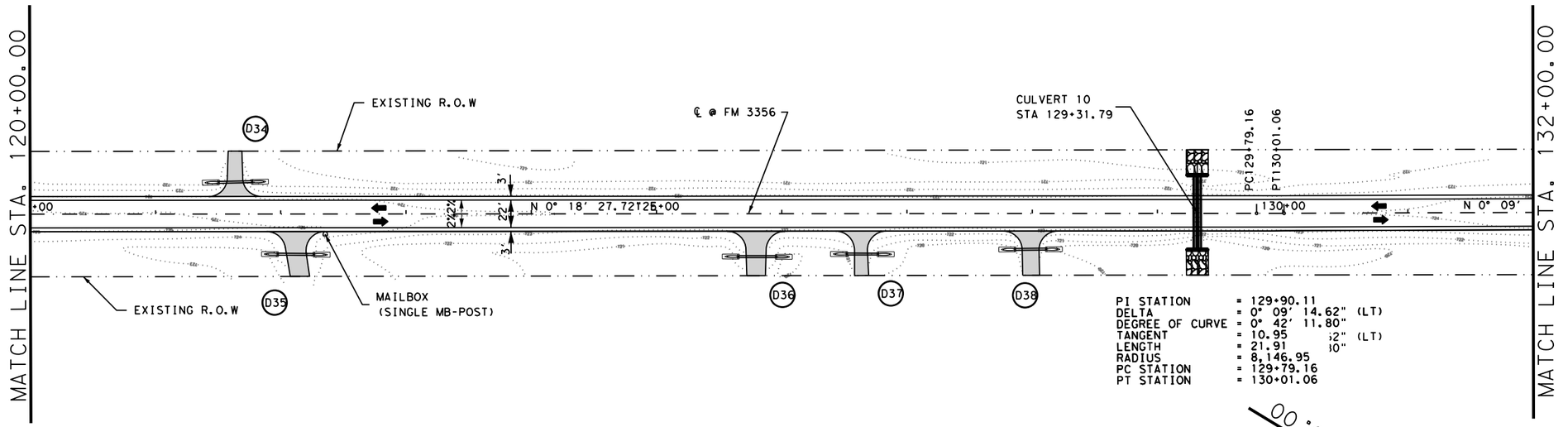
Texas Department of Transportation

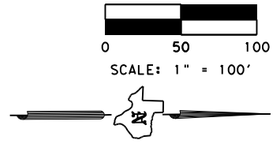
FM 3356

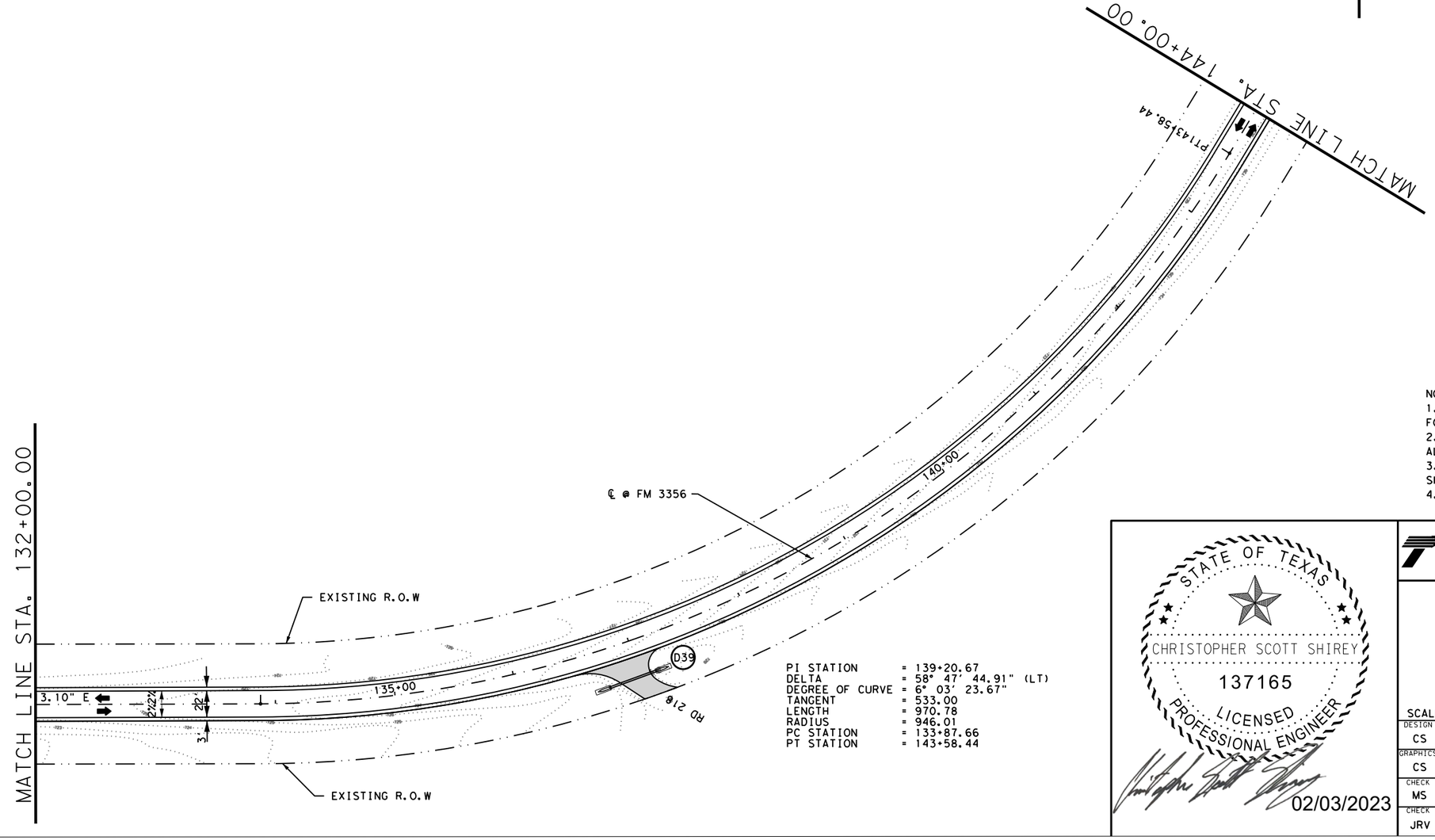
ROADWAY PLAN
STA 96+00 TO 120+00

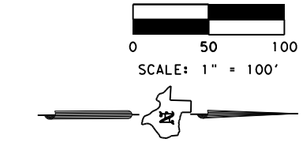
SHEET 5 OF 7

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS: CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK: MS	TEXAS	DALLAS	COLLIN	
CHECK: JRV	CONTROL	SECTION	JOB	48
	3427	03	007	









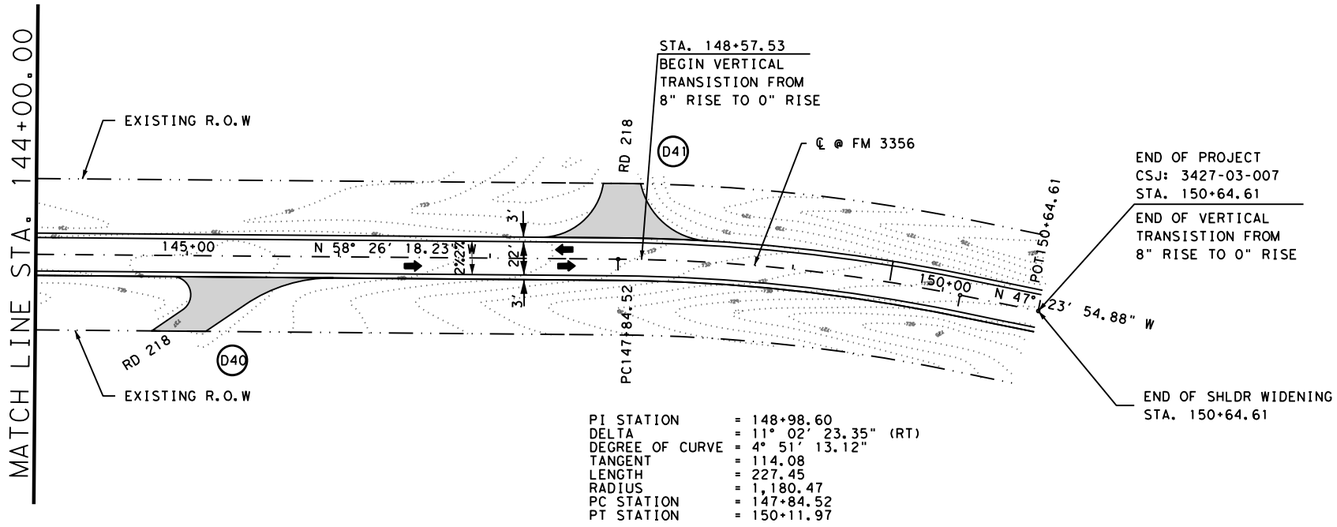
NOTES:
1. SEE TYPICAL SECTIONS SHEETS FOR ADDITIONAL INFORMATION.
2. SEE HORIZONTAL & VERTICAL ALIGNMENT & SUPER-ELEVATION DATA.
3. SEE MISCELLANEOUS ROADWAY DETAILS SHEET FOR PAVEMENT TRANSITION DETAILS.
4. SEE DRIVEWAY SUMMARY FOR MORE DETAIL.

Texas Department of Transportation

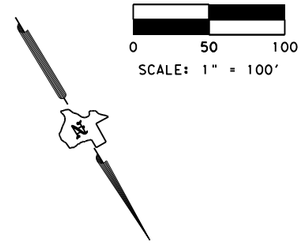
FM 3356
ROADWAY PLAN
STA 120+00 TO 144+00

SCALE: 1"=100' SHEET 6 OF 7

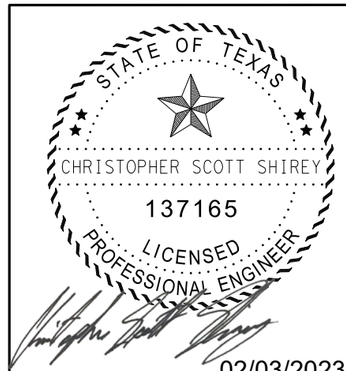
DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	49
	3427	03	007	



PI STATION = 148+98.60
DELTA = 11° 02' 23.35" (RT)
DEGREE OF CURVE = 4° 51' 13.12"
TANGENT = 114.08
LENGTH = 227.45
RADIUS = 1,180.47
PC STATION = 147+84.52
PT STATION = 150+11.97



NOTES:
1. SEE TYPICAL SECTIONS SHEETS FOR ADDITIONAL INFORMATION.
2. SEE HORIZONTAL & VERTICAL ALIGNMENT & SUPER-ELEVATION DATA.
3. SEE MISCELLANEOUS ROADWAY DETAILS SHEET FOR PAVEMENT TRANSITION DETAILS.
4. SEE DRIVEWAY SUMMARY FOR MORE DETAIL.



Texas Department of Transportation

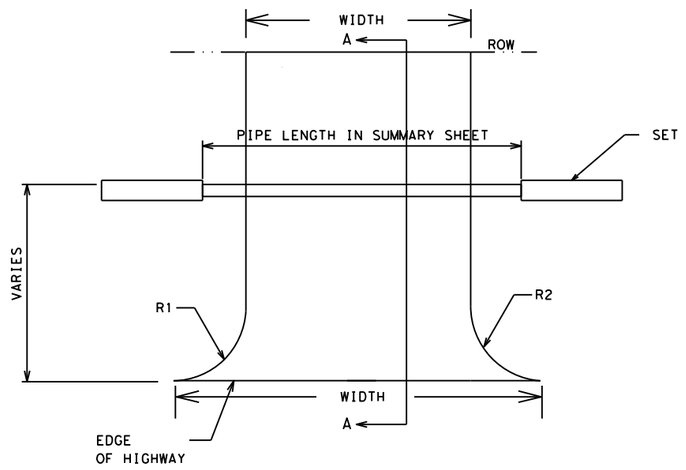
FM 3356

ROADWAY PLAN
STA 144+00 TO 150+64.61

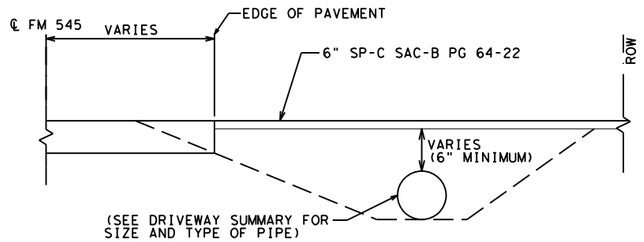
SHEET 7 OF 7

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	50
	3427	03	007	

ASPHALT DRIVEWAY OVERLAY DETAILS W/PIPE REPLACEMENT

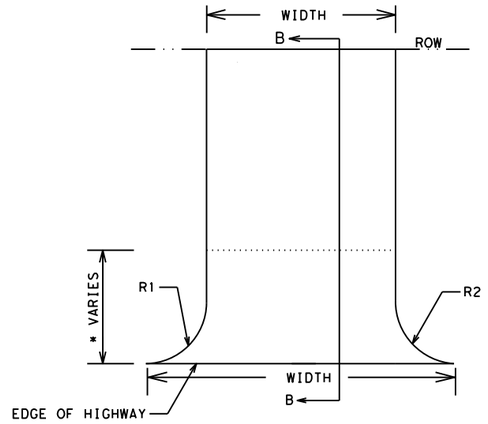


PLAN VIEW

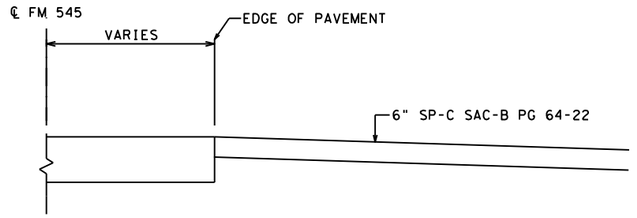


SECTION A-A

ASPHALT DRIVEWAY OVERLAY DETAILS WITHOUT PIPE REPLACEMENT

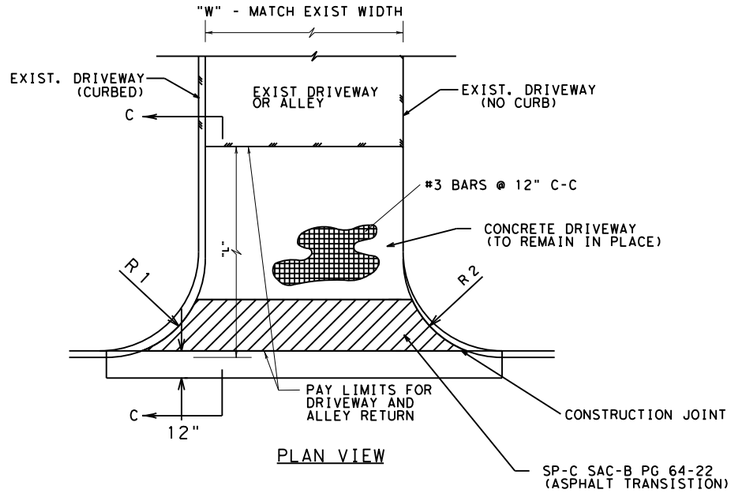


PLAN VIEW

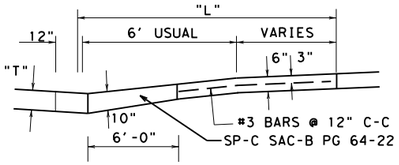


SECTION B-B

CONCRETE DRIVEWAYS



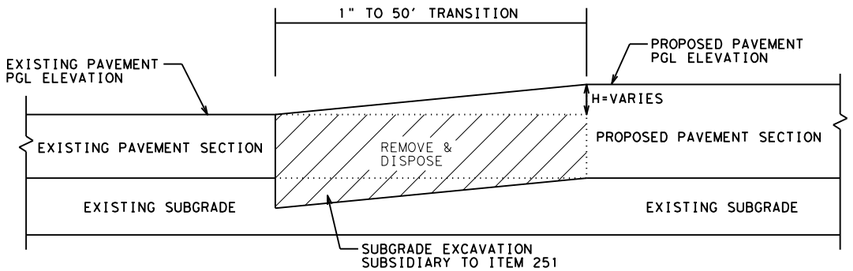
PLAN VIEW



SECTION C-C

NOTES:

1) DRIVEWAY LOCATIONS MAY BE SHIFTED AT TIME OF CONSTRUCTION AS DIRECTED BY THE ENGINEER TO MATCH EXISTING CONDITIONS.
2) MATCH EXISTING DRIVEWAY WIDTH WITH A MINIMUM OF 11'.
3) MATCH EXISTING DRIVEWAY RADIUS WITH A MINIMUM OF 15'.
4) SEE "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION.
5) CUT AND RESTORE FOR DRIVEWAY & INTERSECTIONS WILL BE SUBSIDIARY TO VARIOUS BID ITEMS.



TYPICAL PAVEMENT TRANSITION

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

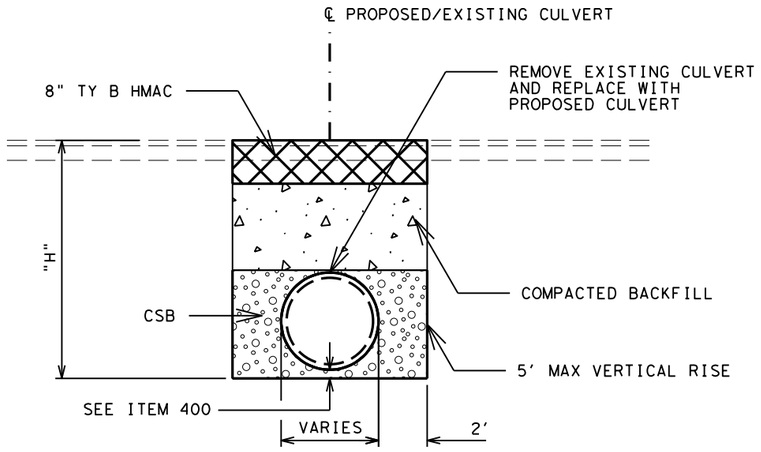
FM 3356 MISCELLANEOUS ROADWAY DETAILS

SCALE: NTS

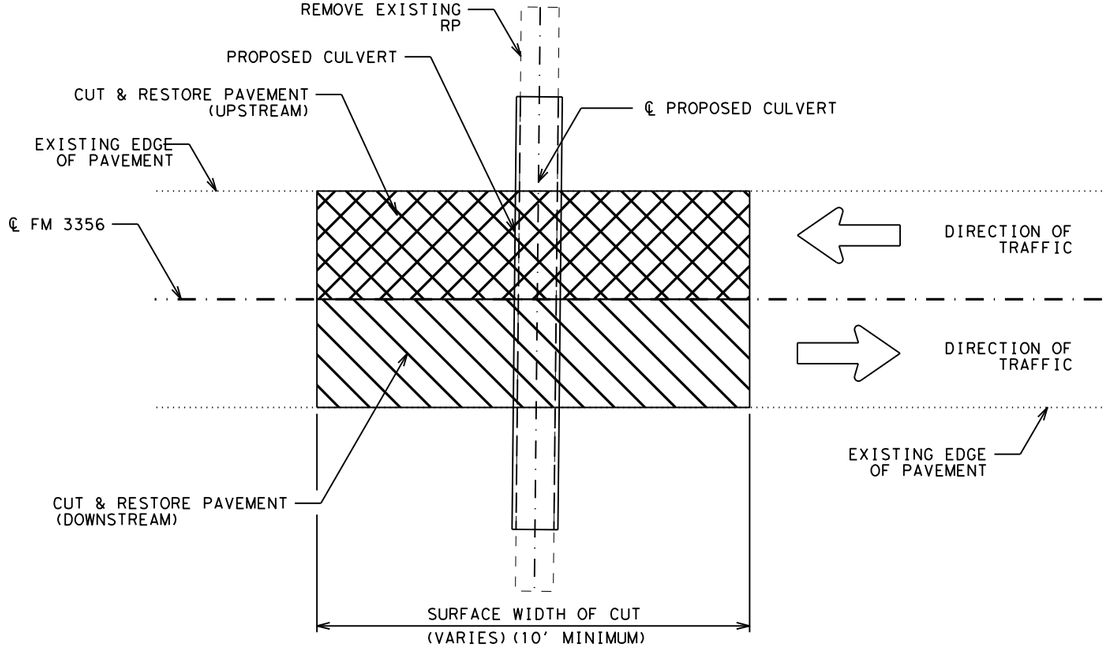
SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CS	TEXAS	DALLAS	COLLIN	
CHECK	CONTROL	SECTION	JOB	51
MS	3427	03	007	
CHECK				
JRV				

DATE: $DATE$ FILE NAME: $FILE$



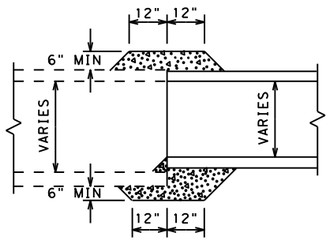
CUT & RESTORE DETAIL
SIDE VIEW



CUT & RESTORE DETAIL
PLAN VIEW

NOTES:

1. SEE THE TxDOT BARRICADE AND CONSTRUCTION AND TRAFFIC CONTROL PLAN STANDARDS FOR ADDITIONAL INFORMATION.
2. SEE CULVERT LAYOUTS FOR ADDITIONAL INFORMATION.
3. CULVERTS SHALL BE CONSTRUCTED FROM DOWNSTREAM TO UPSTREAM.
4. MAINTAIN POSITIVE DRAINAGE DURING CULVERT CONSTRUCTION.
5. MATCH EXISTING CROSS SLOPES AND ELEVATIONS.
6. PROVIDE DAYTIME ONE-WAY TRAFFIC CONTROL AS NECESSARY FOR PHASED CONSTRUCTION. RE-OPEN FM 3356 TO TWO-WAY TRAFFIC AT THE CONCLUSION OF EACH DAY'S WORK.



CONCRETE COLLAR FOR PIPE CONNECTION DETAIL

THIS DETAIL IS TO ALSO BE USED ON ALL CONNECTIONS BETWEEN NEW AND EXISTING PIPES.

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

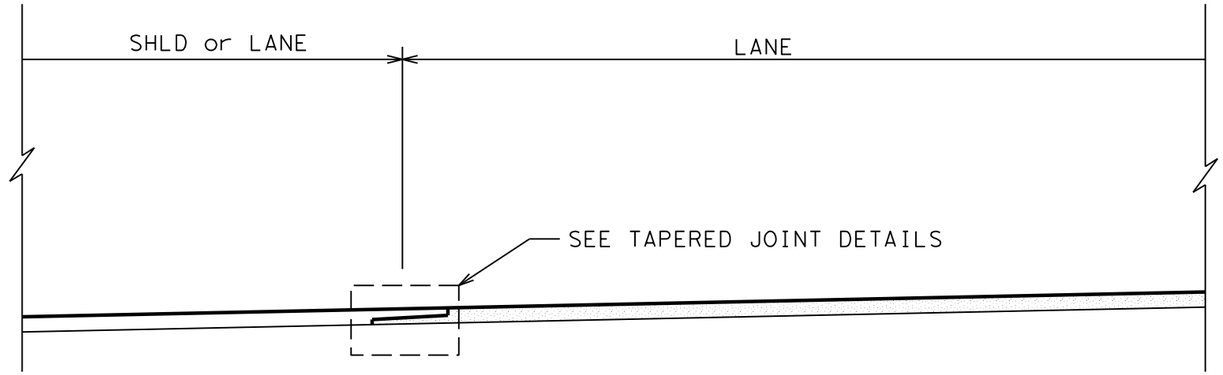
Texas Department of Transportation

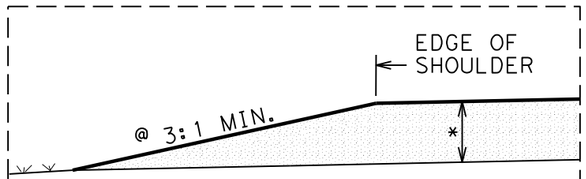
FM 3356 MISCELLANEOUS ROADWAY DETAILS

SCALE: NTS — SHEET 2 OF 2

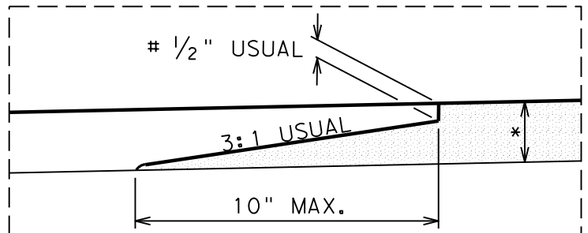
DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CS	TEXAS	DALLAS	COLLIN	52
CHECK	CONTROL	SECTION	JOB	
MS	3427	03	007	
CHECK				
RV				

DATE: $DATE$ FILE NAME: $FILE$

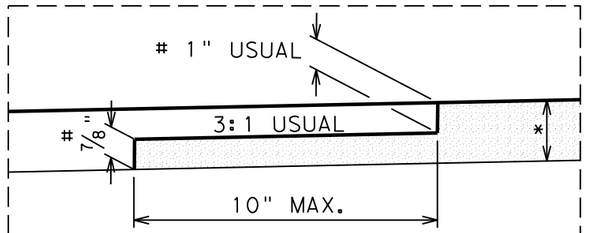




TAPERED OUTSIDE EDGE DETAIL



TAPERED JOINT DETAIL 1.5" TO 4" LIFTS



TAPERED JOINT DETAIL OVER 4" LIFTS

@ IF BACKFILLED SLOPE IS LESS THAN 3:1, COVER WEDGE WITH APPROVED BACKFILL.

* SEE TYPICAL SECTION FOR DEPTH AND TYPE OF HMA.
# NOTCH DEPTH SHALL NOT BE LESS THAN NOMINAL AGGREGATE SIZE.

NOTES:

1. THE ABOVE DETAILS SHALL BE CONSTRUCTED BY TAPERING THE BITUMINOUS MAT. THE TAPERED PORTION SHALL EXTEND BEYOND THE NORMAL LANE WIDTH AND BE LAID MONOLITHICALLY WITH ADJOINING MAT. THE TAPERED PORTION OF THE MAT SHALL BE CONSTRUCTED BY THE USE OF AN APPROVED STRIKE-OFF DEVICE THAT WILL PROVIDE A UNIFORM SLOPE AND WILL NOT RESTRICT THE MAIN SCREED. CLEAN WEDGE PRIOR TO PLACEMENT OF TACK COAT. TACK COAT SHALL BE APPLIED UNIFORMLY TO THE IN-PLACE TAPER WITH A DISTRIBUTOR BEFORE THE ADJACENT MAT IS PLACED. FINAL DENSITY REQUIREMENTS FOR THE ENTIRE PAVEMENT, INCLUDING THE TAPER AREA, WILL REMAIN UNCHANGED. COMPACTION OF THE INITIAL TAPER SECTION WILL BE REQUIRED AS NEAR TO FINAL DENSITY AS POSSIBLE. ROLL ADJACENT MAT FROM HOT SIDE TO COLD.

2. THE TYPE OF DEVICE TO PRODUCE ABOVE REFERENCED DETAILS SHALL PROVIDE INITIAL COMPACTION EQUIVALENT TO LAYDOWN MACHINE, WITH FINAL DENSITY ADHERING TO NOTE 1, AND BE APPROVED BY THE ENGINEER.

3. HOT MIX MATERIAL AND PLACEMENT SHALL BE PAID FOR UNDER THE PERTINENT ITEM. ANY ADDITIONAL SURFACE PREPARATION, TACK COAT, TACK COAT PLACEMENT, EQUIPMENT, LABOR, TOOLS AND INCIDENTALS TO PRODUCE TAPERED EDGE AND JOINTS AS DESCRIBED ABOVE SHALL BE CONSIDERED SUBSIDIARY TO THE HOT MIX ITEM.

4. THE TAPERED JOINT DETAIL IS NOT INTENDED FOR USE ON 2 WAY 2 LANE ROADBED CENTERLINE WITH LESS THAN 22' OVERALL WIDTH.

5. FULL PAVING OF ALL LANES AND SHOULDRS BY THE END OF EACH DAY PRODUCTION WILL NOT REQUIRE A TAPERED JOINT.

HOT MIX EDGE AND LONGITUDINAL JOINT DETAILS DALLAS DISTRICT STANDARD

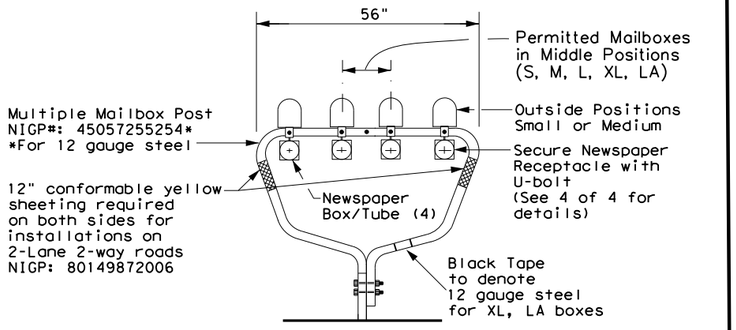
LJD(1-1)-07

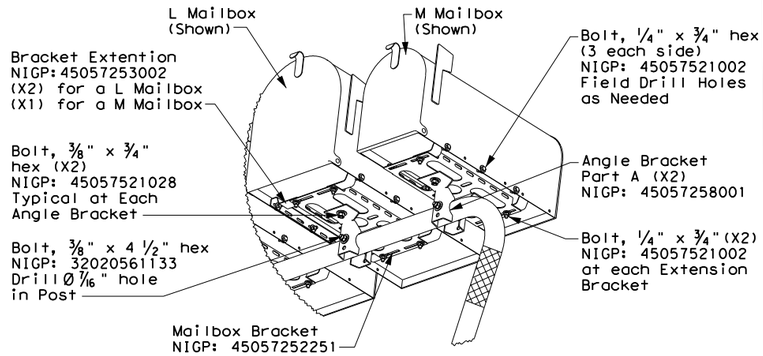
FED. RD. DIV. NO.	PROJECT NUMBER		SHEET NUMBER
18	SEE TITLE SHEET		53
STATE	DISTRICT	COUNTY	
TEXAS	DALLAS	COLLIN	
CONTROL	SECTION	JOB	HIGHWAY NUMBER
3427	03	007	FM 3356

REVISED ON 9/10/08

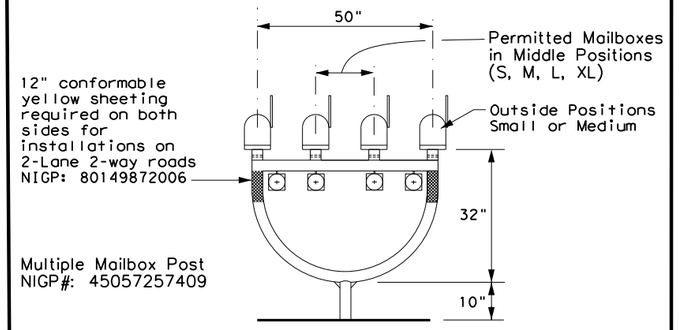
FILENAME: $FILE$

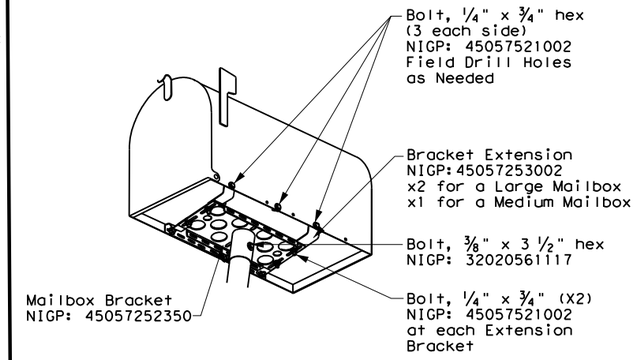
TYPE 1 - MULTIPLE





TYPE 4 - MULTIPLE





MAILBOX SIZES

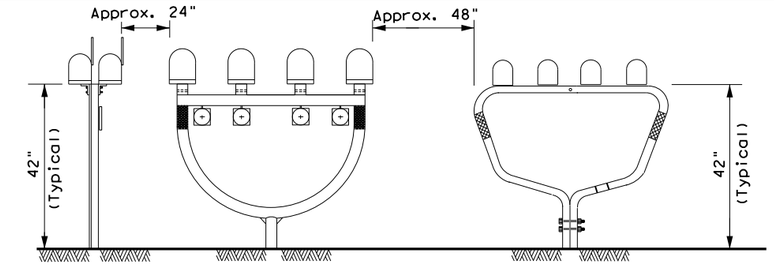
MAILBOX SIZE	TYPICAL DIMENSIONS			MAX **
	LENGTH	WIDTH	HEIGHT	WEIGHT
SMALL	19 1/2"	6"	7"	6 LBS
MEDIUM	22 1/2" *	8" *	11 1/2" *	8 LBS
LARGE	23 1/2"	11 1/2"	13 1/2"	11 LBS
EXTRA LARGE	18"	14"	12"	13 LBS
LOCKABLE	18"	11 1/2"	15"	23 LBS

* See Note 1.
** Excluding Molded Plastic on 4 X 4 Post

GENERAL NOTES:

1. Dimensions shown (length, width, and height) are typical, not maximums. However, anytime a medium size mailbox is mounted on a single/double mount or on the outside position on a multi mount, the dimensions shown are maximums.
2. Mailboxes shall be made of light weight sheet metal or light weight plastic. Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.

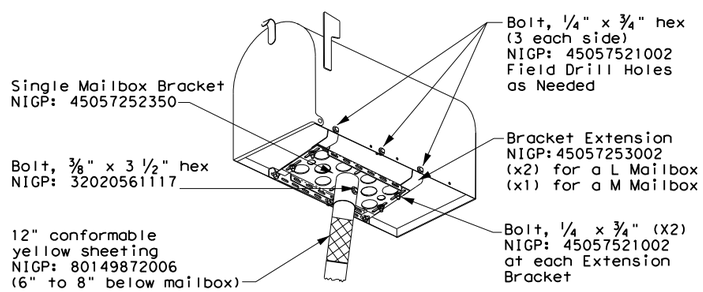
TYPICAL INSTALLATION MEASUREMENTS

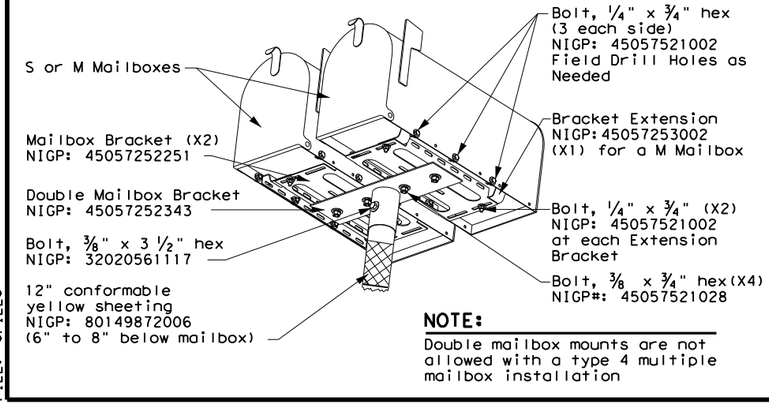


NOTE:

Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Design Standard sheets PED-Pedestrian Facilities Curb Ramps.

TYPE 2 and 4 - SINGLE/DOUBLE

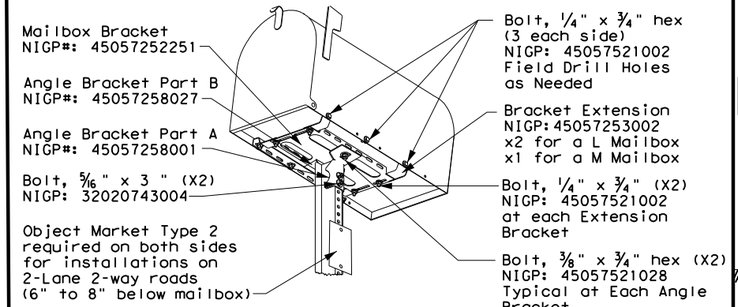


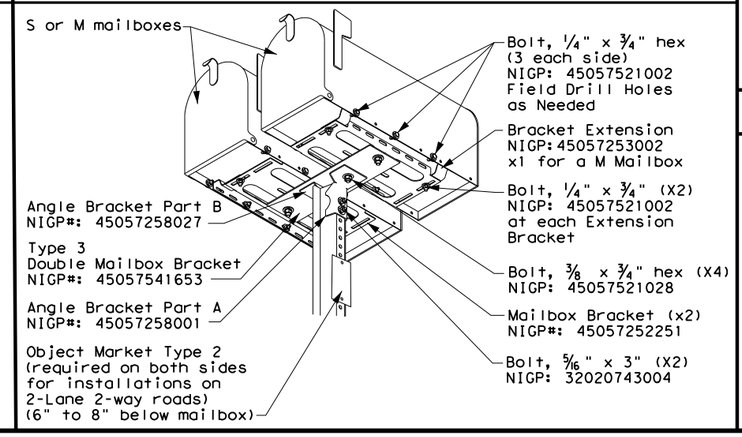


NOTE:

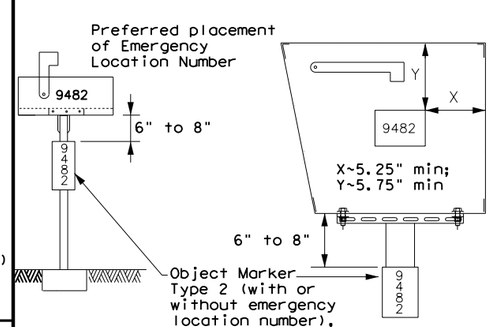
Double mailbox mounts are not allowed with a type 4 multiple mailbox installation

TYPE 3 - SINGLE/DOUBLE





PLACEMENT OF EMERGENCY LOCATION NUMBER

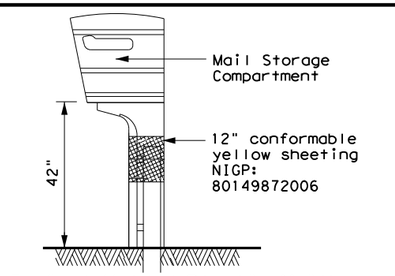


NOTES:

1. Location numbers are provided by homeowner. Minimum size 1" height.
2. Location number is typically placed on the mailbox in a contrasting color.
3. Black numbers may be placed on the Type 2 object marker if the numbers cannot be placed on the mailbox.
4. Alternatively, a green or blue plate with white numbers attached may be mounted below the object marker. Other contrasting color configuration, as approved, may be used.
5. See 3 of 4 for Foundation details.
6. See 4 of 4 for Hardware details.

SHEET 1 OF 4

TYPE 5



Typical Molded Plastic Mailbox

Texas Department of Transportation — Maintenance Division Standard

MAILBOX MOUNTING AND ASSEMBLY

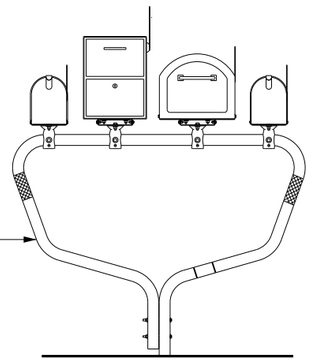
MB(1)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		54

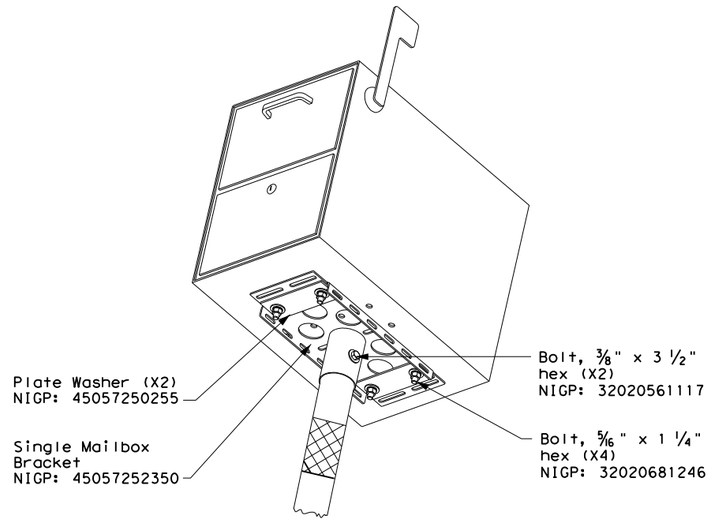
DATE: $DATE$ $TIME$
FILE: $FILE$

DATE: $DATE$ $TIME$
FILE: $FILE$

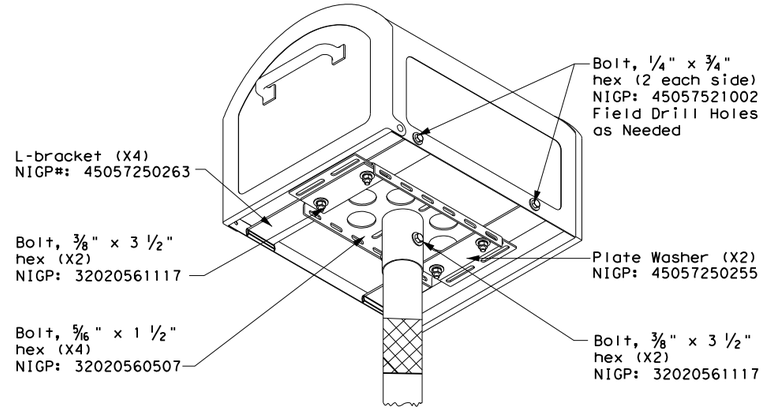
TYPE 1- MULTI LOCKABLE AND XL MAILBOX



TYPE 2/4 - SINGLE LOCKABLE MAILBOX

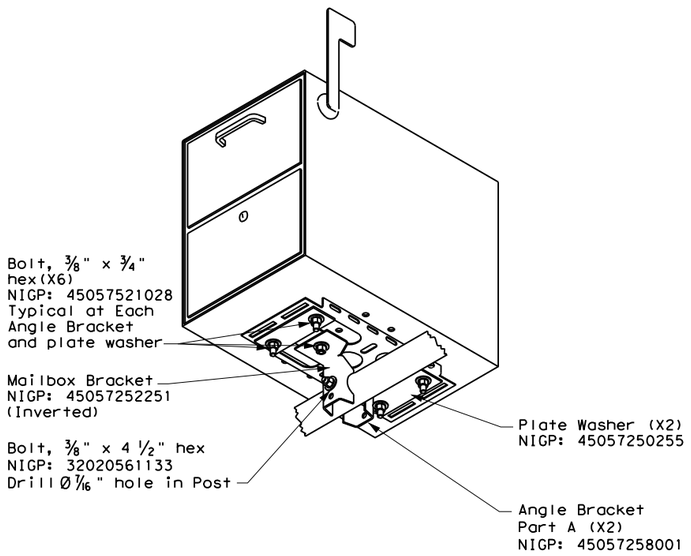


TYPE 2/4 - SINGLE XL MAILBOX

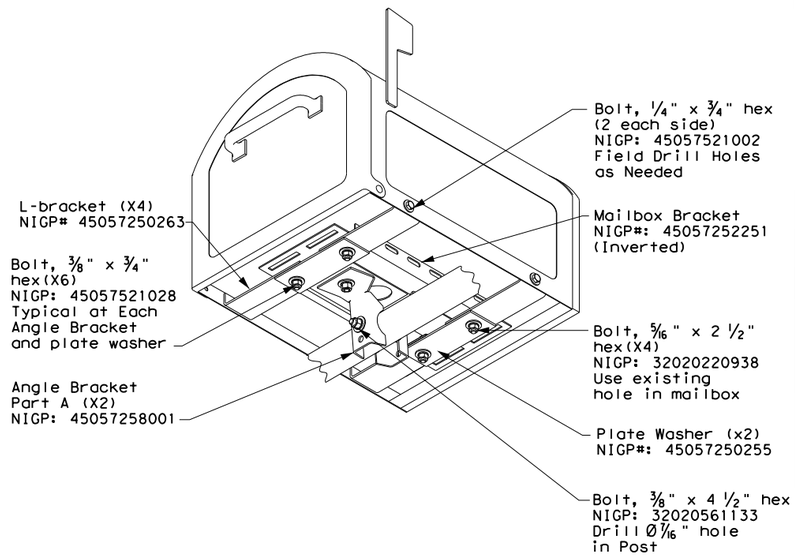


NOTE:
Follow same configuration when mounting an XL mailbox on a Type 4 multi post.

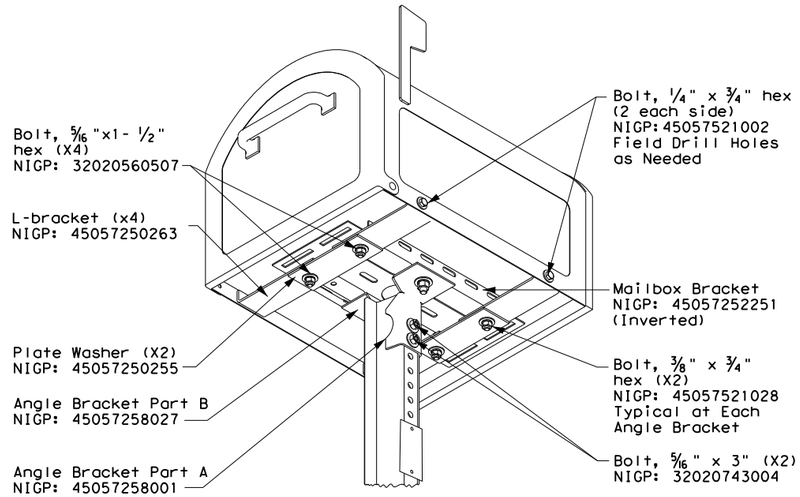
TYPE 1 MULTI – LOCKABLE ARCHITECTURAL (LA)



TYPE 1 MULTI – XL MAILBOX



TYPE 3 - XL MAILBOX MOUNTING



Texas Department of Transportation

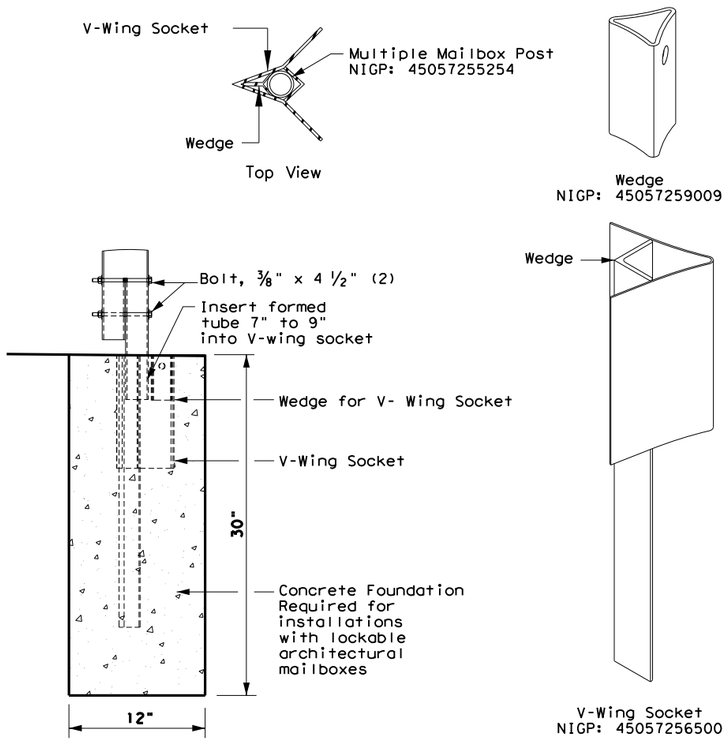
Maintenance Division Standard

XL AND LOCKABLE ARCHITECTURAL MAILBOX ASSEMBLY

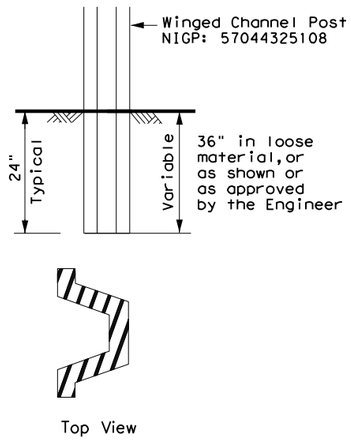
MB(2)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		55

TYPE 1 - SUPPORT/FOUNDATION
Thin Wall Tube w/ V-LOC Anchorage

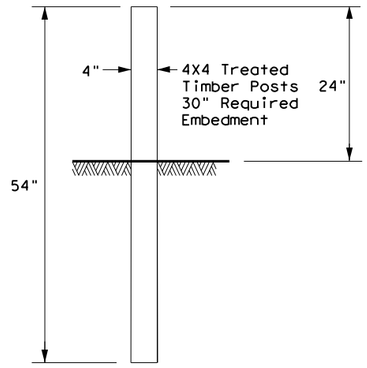


TYPE 3 - SUPPORT/FOUNDATION

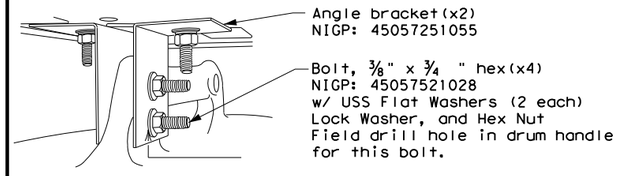


NOTES:
1. Attach Object Marker (OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

TYPE 5 - SUPPORT/FOUNDATION



TYPE 6 - TEMPORARY MAILBOX SUPPORT

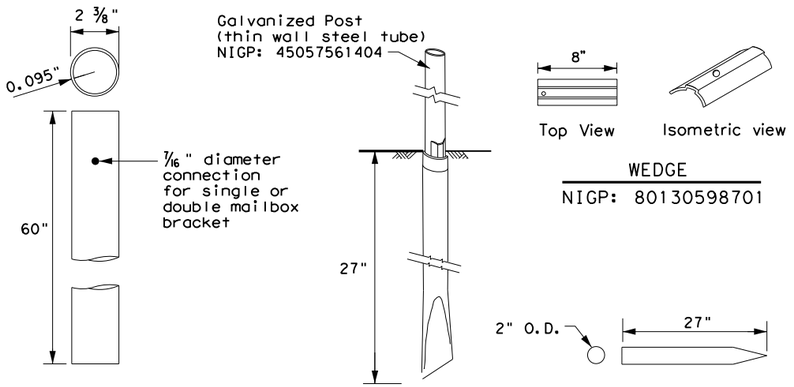


Plastic Drum NIGP: 55093383655
Rubber Collar NIGP: 55093387102

NOTES:
1. Place on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
2. Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

GENERAL NOTES:
1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition, only on Type 1, Type 2, and Type 4

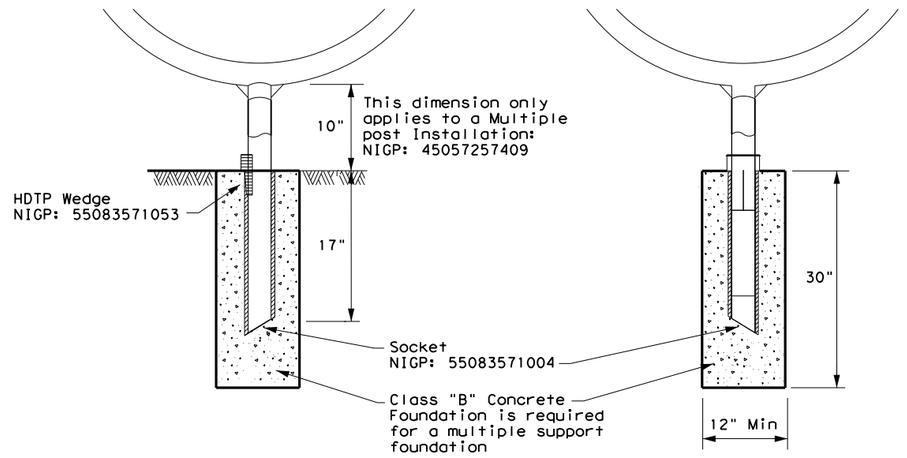
TYPE 2 - SUPPORT/FOUNDATION
Thin Wall Steel Tube w/Wedge Anchor System



MAILBOX POST

WEDGE ANCHOR
NIGP: 80130238407

TYPE 4 - SUPPORT/FOUNDATION
Whitecoated steel post NIGP: 45057561107
Multiple post NIGP: 45057257409
Recycled Rubber post (RR) NIGP: 45057561057



SHEET 3 OF 4

Texas Department of Transportation | Maintenance Division Standard

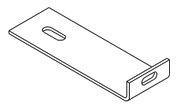
MAILBOX SUPPORT AND FOUNDATION

MB(3)-21

FILE: MB-21.dgn	DN:	CK:	DW:	CK:
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		56

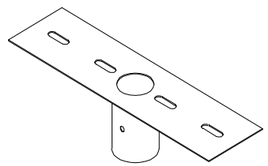
DATE: $DATE$ $TIME$
FILE: $FILE$

TYPE	TYPE 1	TYPE 2	TYPE 3	TYPE 4			TYPE 5	TYPE 6
Configuration	Multiple	Single or Double	Single or Double	Single	Double	Multiple	Single	Single
Mailbox Size NIGP #	Outside Position: S or M Inside Position: S, M, L, XL, or LA	Single: S, M, L, XL, or LA Double: SS, SM, MM	Single: S, M, L, or XL Double: SS, SM, MM	S, M, L, XL, or LA	SS, SM, or MM	Outside Position: S or M Inside Position: S, M, L, or XL	Molded Plastic	S, or M
Mailbox Post NIGP #	45057255254 (Galvanized Multiple)	45057561404 (Thin Walled Gavanize)	57044325108 (Wing Channel Post)	45057561107 (Thin walled white powder coated) 45057561057 (Recycled Rubber Post: S or M only)	45057561107 (Thin Walled White Powder Coated)	45057257409 (White Powder Coated Multiple)	4x4 Timber	Construction Barrel
Post and Mailbox Hardware NIGP #	45057259009 (Wedge) 45057256500 (V-Wing Socket) 45057253002 (Bracket Extension) 45057252251 (Mailbox Bracket) 45057258001 (Part A Angle Bracket x2) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	80130598701 (Wedge) 80130238407 (Wedge Anchor) 45057253002 (Bracket Extension) 45057252343 (Double MB Bracket) 45057252350 (S. Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket forXL x4)	45057541653 (Type 3 Double Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057253002 (Bracket Extension) 45057258001 (Part A Angle Bracket) 45057258027 (Part B Angle Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057252350 (Single Mailbox Bracket) 45057253002 (Bracket Extension) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252343 (Double Mount Bracket) 45057252251 (Mailbox Bracket x2)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252350 (Single Mount Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	None	45057251055 Angle Bracket (x2)
Foundation Used	Class B Concrete (Required for LA Mailboxes)	Class B Concrete (Required for LA Mailboxes)	None	Class B Concrete (not used with recycled rubber post, required for LA Mailboxes)	Class B Concrete (not required)	Class B Concrete	None	None



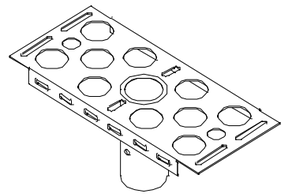
NIGP: 45057250263

L-Bracket x4 for
XL sized mailboxes



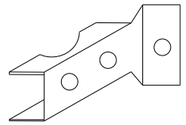
NIGP: 45057252343

Double Mailbox Bracket
For Type 2 and Type 4
double mount



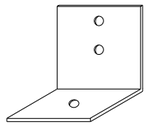
NIGP: 45057252350

Single Mailbox Bracket
For Type 2 single and for
Type 4 single and multi mount



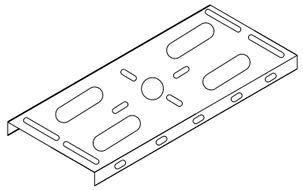
NIGP: 45057258001

Part "A" Angle Bracket
For Type 1 multi (2 per mailbox)
and Type 3 single and double



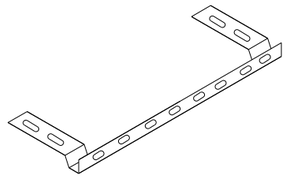
NIGP: 45057251055

Type 6 Angle Bracket
(2 per mailbox)



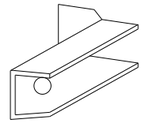
NIGP: 45057252251

Mailbox Bracket
For Type 1 multi and
any double mount (use 2)



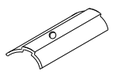
NIGP: 45057253002

Bracket Extension
Use 1 for a medium Mailbox
Use 2 for a Large Mailbox



NIGP: 45057258027

Part "B" Angle Bracket
For Type 3 single
and double



NIGP: 80130598701

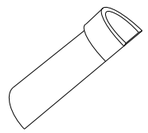
Wedge for Type 2

NIGP: 45057250255

Plate Washer for Architecural
and XL Mailboxes

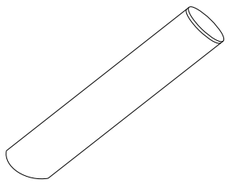
NIGP: 45057541653

Type 3 double mailbox bracket



NIGP: 55083571053

Type 4 Mailbox Wedge

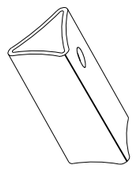


NIGP: 55083571004

Type 4 Mailbox Socket

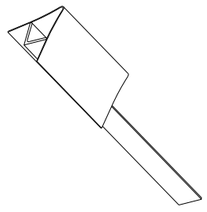
NIGP: 80130238407

Type 2 Wedge Anchor



NIGP: 45057259009

Wedge for Type 1 V-wing Socket



NIGP: 45057256500

V-wing Socket for
Type 1 Foundation

NIGP #	OBJECT MARKERS AND CONFORMABLE SHEETING
55008311759	Type 2 OM 4"x4" (3 Needed) for Type 3 Wing Channel Post
55008312906	Type 2 OM 6"x12" (1 needed) for Type 3 Wing Channel Post
80149872006	12" Conformable Reflective Yellow Sheeting for Flexible Posts

NOTES:

1. Type 2 object marker in accordance with Traffic Engineering Standard Delineators & Object Markers.
2. A light weight receptacle for newspaper delivery can be attached to mailbox posts if the receptacle does not touch the mailbox, present a hazard to traffic or delivery of the mail, extend beyond the front of the mailbox, or display advertising, except the publication title.

BID CODES FOR CONTRACTS

MB-(X) ASSM TY (XXX) (X)

Type of Mailbox
- S = Single
- D = Double
- M = Multiple
- MP = Molded Plastic

Type of Post
- WC = Winged Channel Post
- RR = Recycled Rubber
- TWW = Thin Walled White Tubing
- TWG = Thin Walled Galvanized Tubing
- TIM = Timber

Type of Foundation
- Ty 1 = V-Loc
- Ty 2 = Wedge Anchor Steel System
- Ty 3 = Winged Channel post
- Ty 4 = Wedge Anchor Plastic System
- Ty 5 = 4 X 4 Post

DATE: $DATE$ $TIME$
FILE: $FILE$

SHEET 4 OF 4

Texas Department of Transportation — Maintenance Division Standard

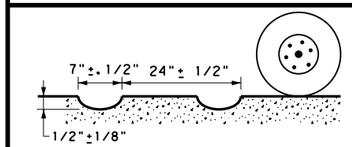
NIGP PARTS LIST AND COMPATIBILITY

MB(4)-21

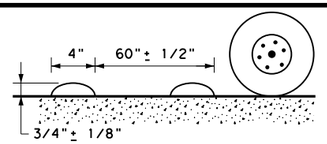
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		57

DATE: $DATE$ $TIME$
FILE: $FILE$

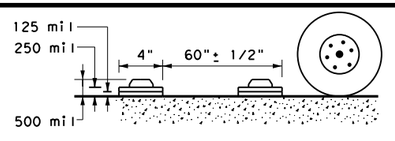
CENTERLINE RUMBLE STRIPS



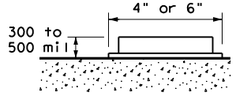
MILLED RUMBLE STRIPS



RAISED TRAFFIC BUTTONS

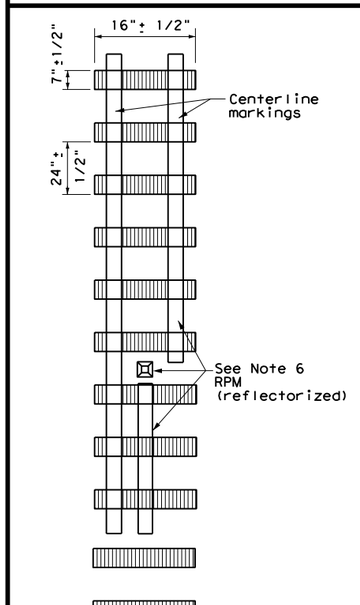


PREFORMED THERMOPLASTIC STRIPS



PROFILE MARKINGS

PROFILE VIEW

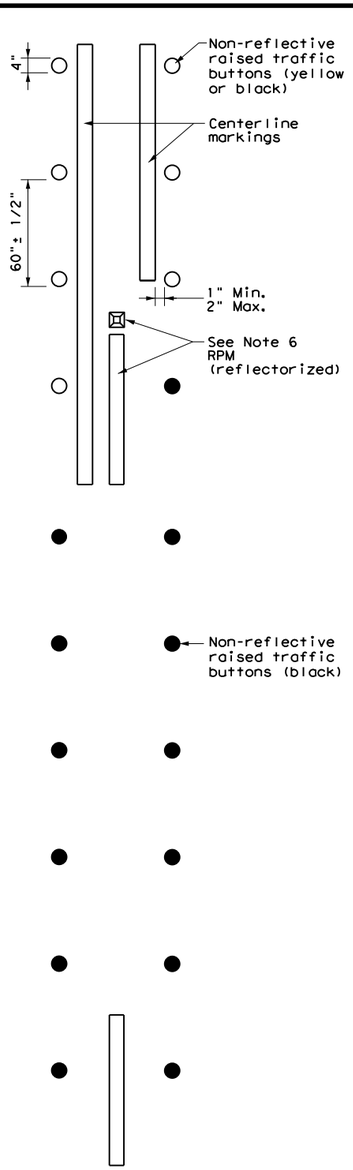


PLAN VIEW
OPTION 1

TWO LANE TWO-WAY ROADWAYS

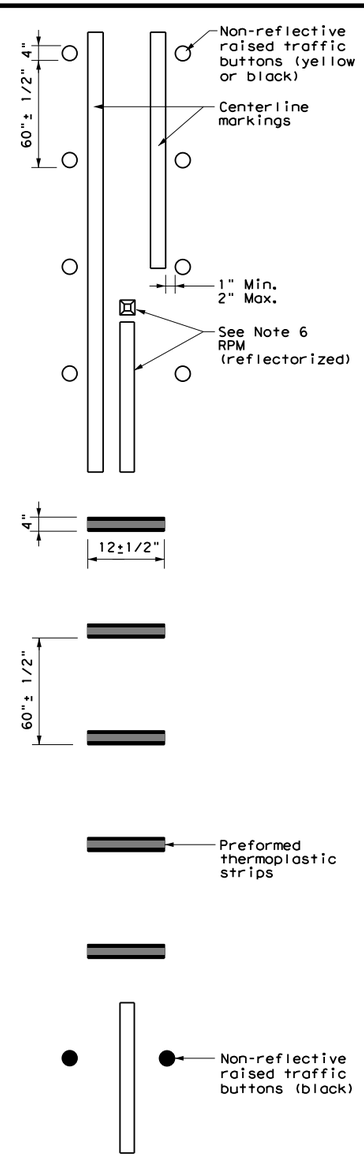
PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS



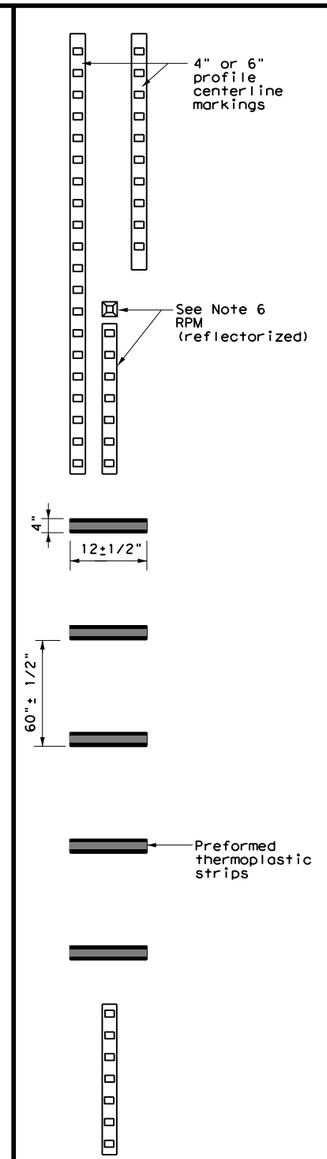
PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



PLAN VIEW
OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.

WHEN INSTALLING EDGELINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

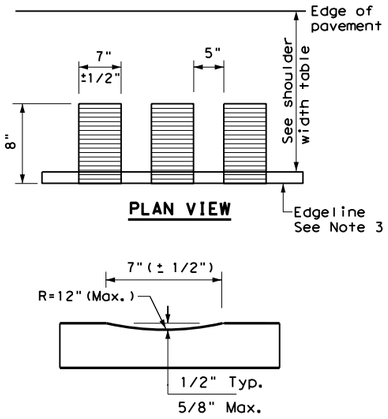
12. See standard sheet RS(4).

Texas Department of Transportation®
Traffic Operations Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

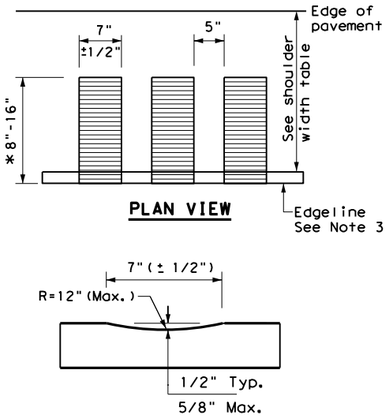
RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3427
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		58



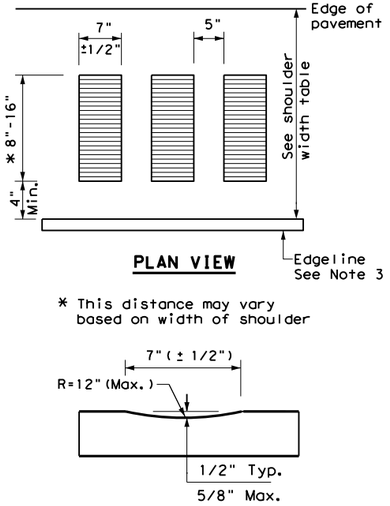
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



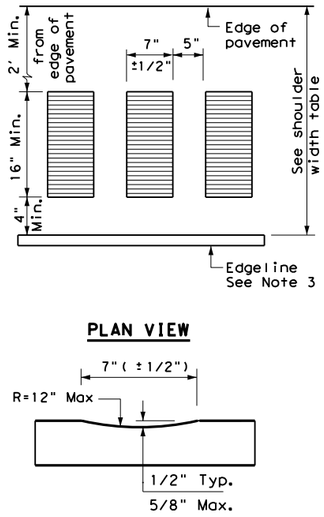
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



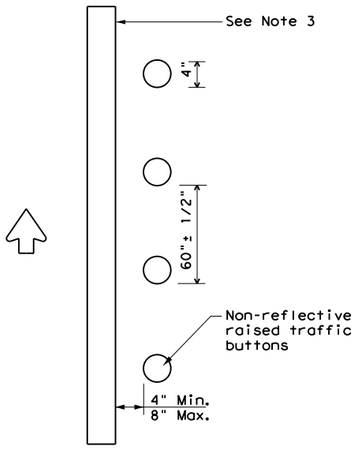
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



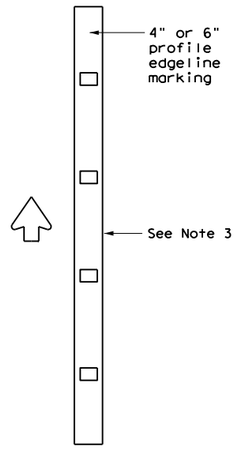
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



OPTION 5

RAISED EDGELINE RUMBLE STRIPS



OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.

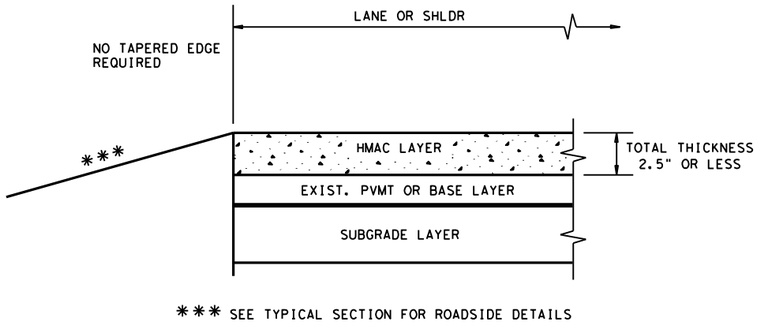
Texas Department of Transportation

Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS
RS(4)-13

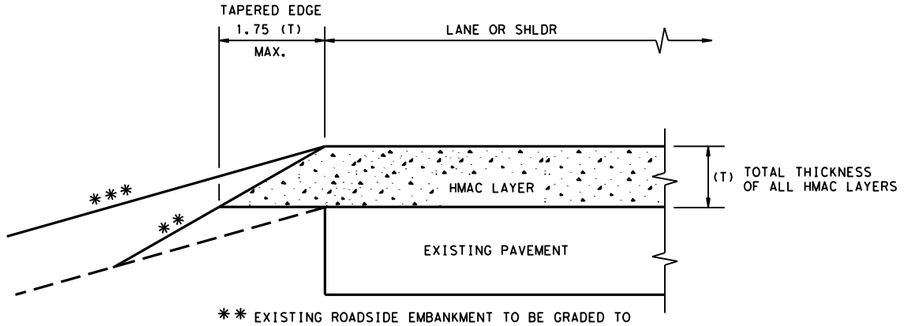
FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		59

DATE: $DATE$ $TIME$
FILE: $FILE$



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

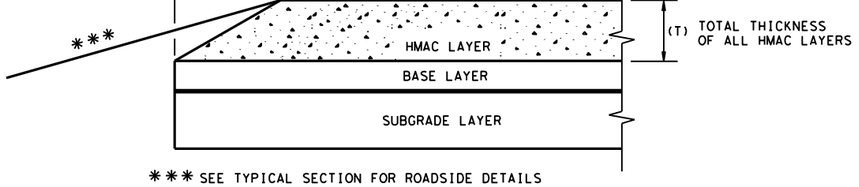
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY
WITH THICKNESS OF 2.5" OR LESS



** EXISTING ROADSIDE EMBANKMENT TO BE GRADED TO PRODUCE A SMOOTH LEVEL SURFACE FOR PLACEMENT OF TAPERED EDGE. THIS WORK IS SUBSIDIARY TO THE VARIOUS BID ITEMS.

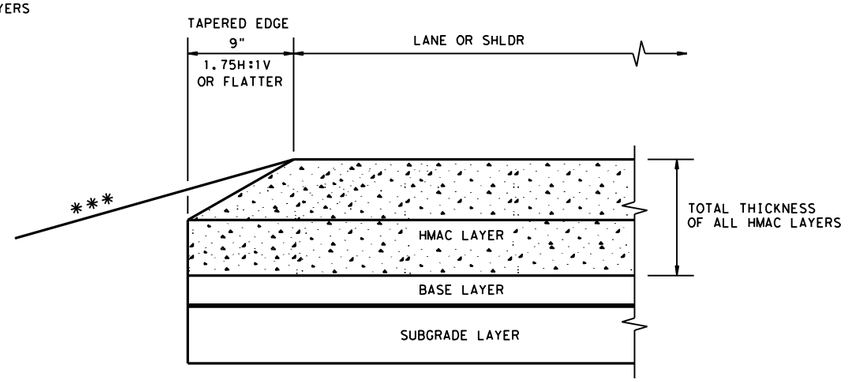
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 2
OVERLAY OF EXISTING PAVEMENT
HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 3
NEW OR RECONSTRUCTED PAVEMENT
HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 4
NEW OR RECONSTRUCTED PAVEMENT
HMAC THICKNESS 5" OR GREATER

(NOT TO SCALE)

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, A VERTICAL EDGE IS PERMISSIBLE FOR HMAC PLACED GREATER THAN 5" BELOW THE EDGE OF PAVEMENT AND FOR THICKNESS OF HMAC LESS THAN 2.5".
2. FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
3. PAYMENT FOR TAPERED EDGE WILL BE IN ACCORDANCE WITH APPLICABLE ITEMS IN THE CONTRACT.
4. THE SLOPE OF THE TAPERED EDGE SHALL BE 1.75H:1V OR FLATTER.
5. THE TAPERED EDGE SHALL BE PRODUCED BY USE OF A SCREED ATTACHMENT CAPABLE OF PRODUCING A SMOOTH COMPACTED SURFACE. ADDITIONAL COMPACTING EFFORT BEHIND THE SCREED IS NOT REQUIRED.

PRELIMINARY

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW ONLY UNDER AUTHORITY OF:

CHRISTOPHER SCOTT SHIREY
P.E. 137165

ON: 08/26/2022

IT IS NOT FOR CONSTRUCTION, BIDDING OR PERMITTING PURPOSES

Texas Department of Transportation

Design Division Standard

TAPERED EDGE DETAILS
HMAC PAVEMENT

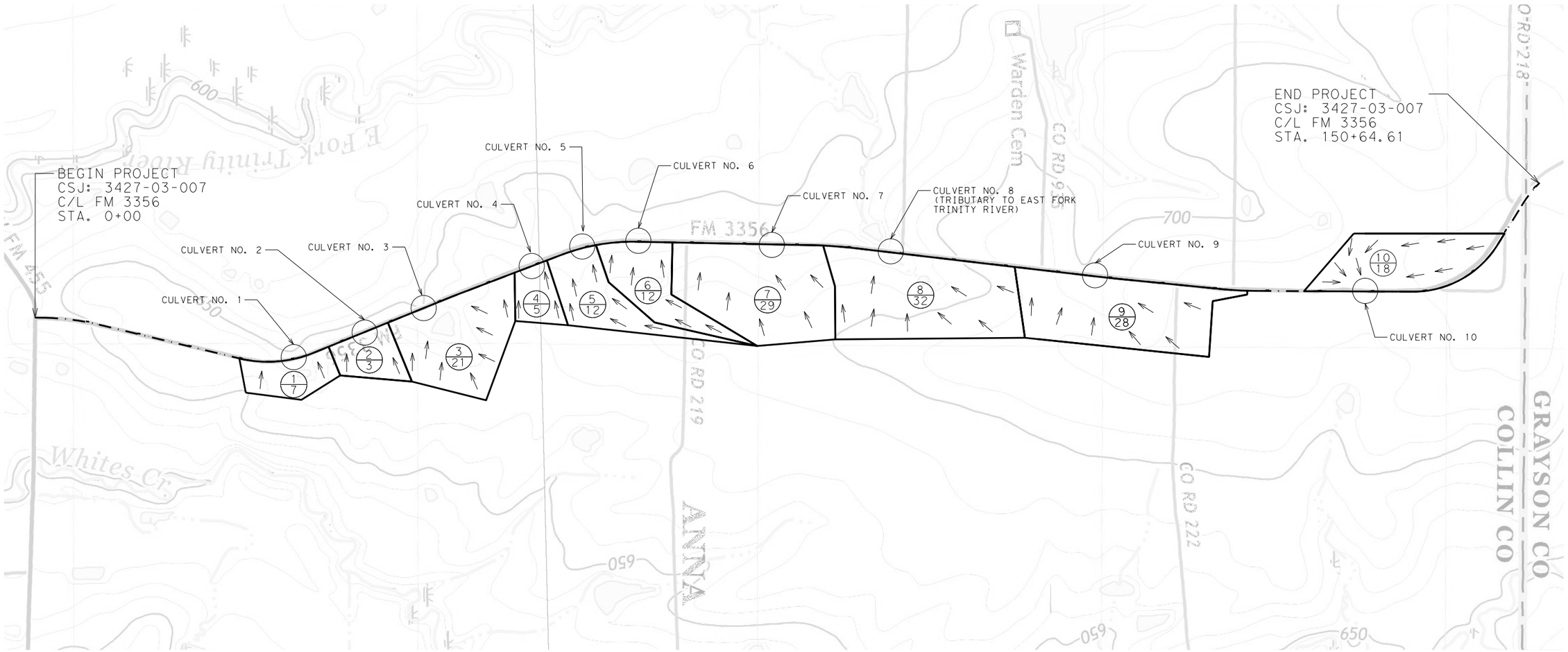
TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:
© TxDOT January 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		60

DATE: $DATE$
FILE: $FILE$

0 1000 2000

SCALE IN FEET



LEGEND

- (X / X) ← DRAINAGE AREA NUMBER / DRAINAGE AREA (ACRES)
- ○ ← STRUCTURE LOCATION
- ← DIRECTION OF FLOW
- ——— DRAINAGE BOUNDARY

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

FM 3356
DRAINAGE AREA MAP

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CS	TEXAS	DALLAS	COLLIN	
CHECK MS	CONTROL	SECTION	JOB	61
CHECK JRV	3427	03	007	

RATIONAL METHOD RUNOFF CALCULATIONS

DESCRIPTION	Cr	Ci	Cv	Cs	C	A	T_c	2-YEAR		5-YEAR		10-YEAR (DESIGN)		25-YEAR		50-YEAR		100-YEAR (CHECK)	
								I_2	Q_2	I_5	Q_5	I_{10}	Q_{10}	I_{25}	Q_{25}	I_{50}	Q_{50}	I_{100}	Q_{100}
						(acres)	(min)	(in/hr)	(cfs)	(in/hr)	(cfs)	(in/hr)	(cfs)	(in/hr)	(cfs)	(in/hr)	(cfs)	(in/hr)	(cfs)
CULVERT NO. 1	0.14	0.12	0.06	0.11	0.43	7.00	10.0	4.43	13.35	5.64	16.97	6.53	19.67	8.04	24.21	9.14	27.52	9.38	28.25
CULVERT NO. 2	0.14	0.12	0.06	0.11	0.43	3.00	10.0	4.43	5.72	5.64	7.27	6.53	8.43	8.04	10.38	9.14	11.80	9.38	12.11
CULVERT NO. 3	0.14	0.12	0.06	0.11	0.43	21.00	10.0	4.43	40.04	5.64	50.91	6.53	59.01	8.04	72.64	9.14	82.57	9.38	84.74
CULVERT NO. 4	0.14	0.12	0.06	0.11	0.43	5.00	10.0	4.43	9.53	5.64	12.12	6.53	14.05	8.04	17.30	9.14	19.66	9.38	20.18
CULVERT NO. 5	0.14	0.12	0.06	0.11	0.43	12.00	13.6	3.91	20.15	4.98	25.68	5.78	29.82	7.04	36.34	8.00	41.30	8.35	43.06
CULVERT NO. 6	0.14	0.12	0.06	0.11	0.43	12.00	10.0	4.43	22.88	5.64	29.09	6.53	33.72	8.04	41.51	9.14	47.18	9.38	48.42
CULVERT NO. 7	0.14	0.12	0.06	0.11	0.43	29.00	10.0	4.43	55.30	5.64	70.30	6.53	81.49	8.04	100.31	9.14	114.03	9.38	117.02
CULVERT NO. 8	0.14	0.12	0.06	0.11	0.43	32.00	11.0	4.27	58.75	5.43	74.74	6.30	86.68	7.73	106.37	8.79	120.90	9.06	124.69
CULVERT NO. 9	0.14	0.12	0.06	0.11	0.43	28.00	10.0	4.43	53.39	5.64	67.88	6.53	78.68	8.04	96.86	9.14	110.10	9.38	112.98
CULVERT NO. 10	0.14	0.12	0.06	0.11	0.43	18.00	10.3	4.38	33.92	5.57	43.13	6.46	50.00	7.94	61.49	9.03	69.89	9.28	71.84

NOTE:

1. DRAINAGE ANALYSIS PERFORMED IN CONFORMANCE WITH THE TXDOT HYDRAULIC DESIGN MANUAL SEPTEMBER 2019) PROCEDURES .
2. RATIONAL METHOD USED TO ANALYZE DRAINAGE BASIN LESS THAN 200 ACRES.
3. TIME OF CONCENCRATION (T)DETERMINED BY NRCS METHOD.
4. RAINFALL INTENSITIES CALCULATED "BASED ON NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION'S (NOAA) ATLAS 14 PRECIPITATION-FREQUENCY ATLAS OF THE UNITED STATES, VOLUME 11 VERSION 2.0: TEXAS" (PERICA ET AL 2018).

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

FM 3356
HYDROLOGIC AND HYDRAULIC CALCULATIONS

SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	62
CHECK JRV	CONTROL	SECTION	JOB	
	3427	03	007	

DATE: $DATE$ FILE NAME: $FILE$

CULVERT HYDRAULICS CALCULATIONS

FM 3356 CULVERT HYDRAULICS																	
						10 YEAR (DESIGN)						100 YEAR (CHECK)					
Cul No.	Sta.	DESCRIPTION		DRAINAGE AREA	ALLOWABLE HEADWATER	RUNOFF (CFS)	HW ELEV (FT)	TW ELEV (FT)	TW DEPTH (FT)	OUTLET VELOCITY (FPS)	TW VELOCITY (FPS)	RUNOFF (CFS)	HW ELEV (FT)	TW ELEV (FT)	TW DEPTH (FT)	OUTLET VELOCITY (FPS)	TW VELOCITY (FPS)
No. 1	25+12.55	EXISTING	1-24" CMP	1		19.67	646.29	642.22	0.92	7.34	11.66	28.25	649.79	642.35	1.05	9.37	12.76
		PROPOSED	1-24" RCP	1		19.67	644.75	642.04	0.75	7.51	10.03	28.25	646.39	642.15	0.86	9.37	10.98
No. 2	32+32.76	EXISTING	1-24" CMP	2		8.43	650.86	649.32	0.51	5.14	11.00	12.11	651.42	649.39	0.58	5.89	12.04
		PROPOSED	1-36" RCP	2		8.43	654.49	651.08	0.58	10.39	8.26	12.11	654.75	651.17	0.60	11.85	9.04
No. 3	38+38.84	EXISTING	1-48" CMP	3		59.01	645.41	642.15	1.15	7.86	3.18	84.74	646.71	642.32	1.32	9.07	3.48
		PROPOSED	1-48" RCP	3		59.01	647.56	644.48	0.99	7.99	4.34	84.74	648.71	644.62	1.13	9.07	4.75
No. 4	49+59.79	EXISTING	1-24" CMP	4		14.05	661.77	659.25	0.45	6.24	5.80	20.18	663.39	659.31	0.51	7.44	6.35
		PROPOSED	1-24" RCP	4		14.05	661.27	659.40	0.60	6.24	3.25	20.18	662.02	659.49	0.69	7.44	3.56
No. 5	54+59.64	EXISTING	1-36" CMP	5		29.82	654.19	652.42	1.62	6.90	2.82	43.06	655.36	652.66	1.86	8.00	3.10
		PROPOSED	1-36" RCP	5		29.82	657.13	654.59	1.04	9.81	6.93	43.06	657.94	654.74	1.19	10.72	7.60
No. 6	59+90.62	EXISTING	1-36" CMP	6		33.72	659.03	657.27	1.86	7.22	3.01	48.42	660.49	657.24	2.13	8.46	3.29
		PROPOSED	1-36" RCP	6		33.72	661.21	658.22	1.06	11.13	9.22	48.42	662.17	658.37	1.21	12.08	10.10
No. 7	72+68.64	EXISTING	2-36" CMP	7		81.49	661.62	658.90	1.40	7.81	8.27	117.02	663.62	659.11	1.61	9.39	9.07
		PROPOSED	2-36" RCP	7		81.49	661.16	658.94	1.44	7.81	7.83	117.02	662.42	659.15	1.65	9.39	8.57
No. 8	83+98.64	EXISTING	2-42" CMP	8		86.86	669.10	666.95	1.66	7.43	3.14	124.69	670.21	667.19	1.90	8.58	3.44
		PROPOSED	2-42" RCP	8		86.86	671.11	669.14	1.55	7.43	4.50	124.69	671.93	669.37	1.78	8.58	4.93
No. 9	103+53.01	EXISTING	2-42" CMP	9		78.68	701.21	697.11	1.89	9.64	3.61	112.98	701.82	697.38	2.18	10.09	3.95
		PROPOSED	2-42" RCP	9		78.68	698.65	696.15	1.17	10.05	9.62	112.98	699.45	696.32	1.34	10.98	10.53
No. 10	129+31.79	EXISTING	2-24" CMP	10		50.00	722.63	719.21	1.91	7.07	7.42	71.84	722.74	719.15	2.18	7.17	8.13
		PROPOSED	2-24" RCP	10		50.00	723.00	720.06	1.06	8.53	14.94	71.84	724.83	720.21	1.21	10.66	16.35

NOTE:

1. HY-8 V7.5 USED TO ANALYZE CULVERTS.
2. ALL ELEVATIONS ARE BASED ON THE NAVD88 VERTICAL DATUM.
3. THE DOWNSTREAM WATER SURFACE ELEVATION WAS BASED ON NORMAL DEPTH AT A CHANNEL SLOPE OF 0.003 FT/FT.

STATE OF TEXAS
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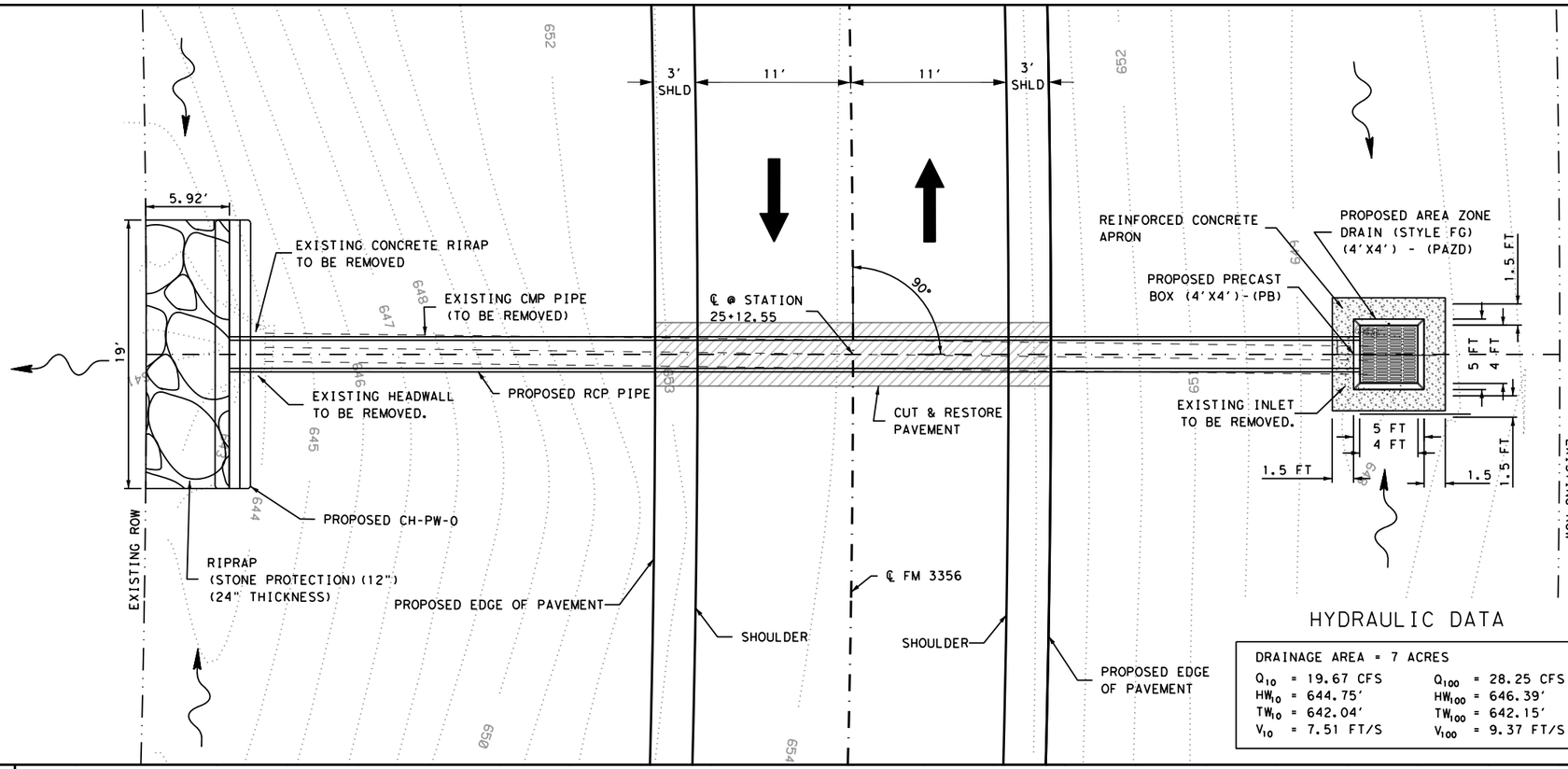
FM 3356
HYDROLOGIC AND HYDRAULIC CALCULATIONS

SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CS	TEXAS	DALLAS	COLLIN	63
CHECK	CONTROL	SECTION	JOB	
MS	3427	03	007	
CHECK				
JRV				

DATE: $DATE$ FILE NAME: $FILE$



HYDRAULIC DATA

DRAINAGE AREA = 7 ACRES

Q_{10} = 19.67 CFS	Q_{100} = 28.25 CFS
HW_{10} = 644.75'	HW_{100} = 646.39'
TW_{10} = 642.04'	TW_{100} = 642.15'
V_{10} = 7.51 FT/S	V_{100} = 9.37 FT/S

PRECAST JUNCTION BOX HYDRAULIC DATA

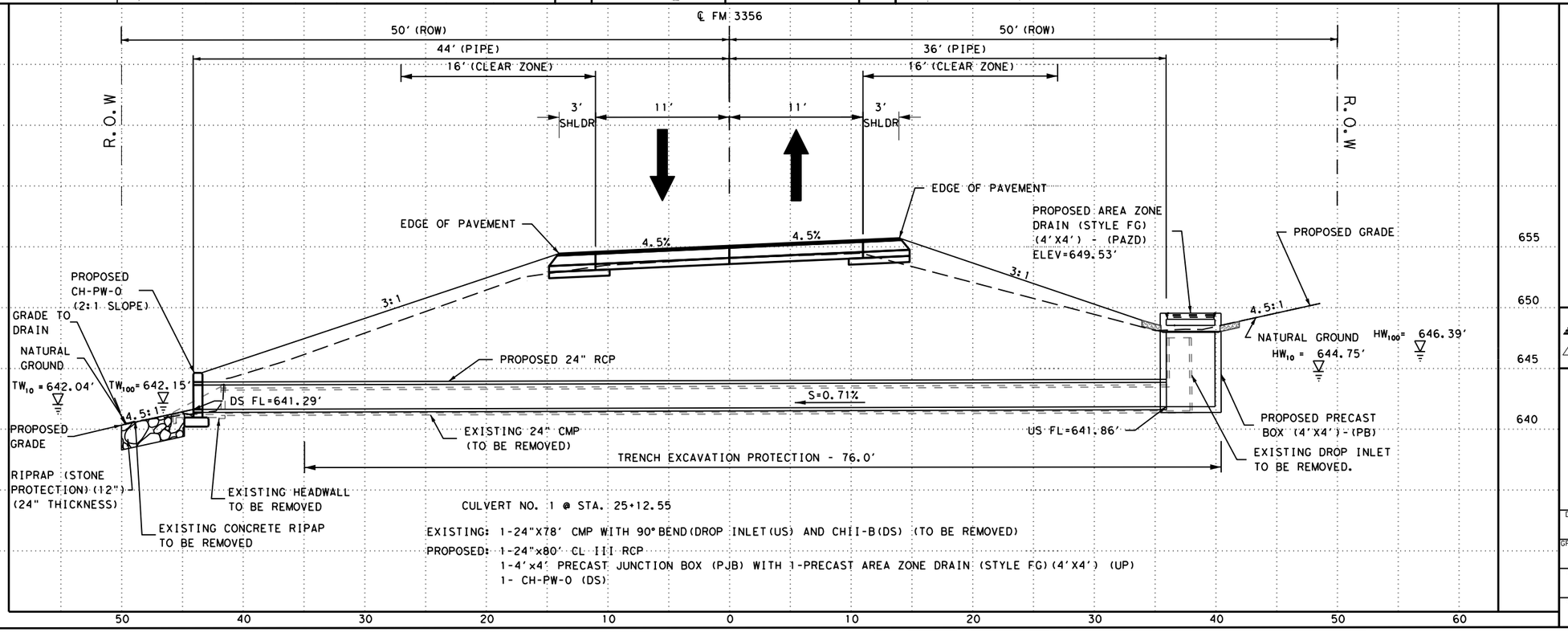
SCALE IN FEET: 0 2 4 6 8 10

	GRATE LENGTH	GRATE WIDTH
PROPOSED PRECAST JUNCTION BOX	4 FT	4 FT

PERIMETER: 16 FT
EFFECTIVE PERIMETER: 8 FT
AREA: 12.8 FT'
EFFECTIVE AREA: 6.4 FT'
DEPTH AT CENTER OF GRATE: 1.115 FT
COMPUTED TOP WIDTH AT SAG: 7.804 FT
FLOW TYPE: WEIR FLOW
EFFICIENCY: 0.5000

CULVERT 1

ITEM	NUMBER	ITEM DESCRIPTION	UNIT	QUANTITY
104	6009	REMOVING CONC (RIPRAP)	SY	1
400	6005	CEM STABIL BKFL	CY	36
400	6008	CUT & RESTORING ASPH PAVING	SY	14
402	6001	TRENCH EXCAVATION PROTECTION	LF	76
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	CY	9
464	6005	RC PIPE (CL III) (24 IN)	LF	80
465	6160	INLET (COMPL) (PAZD) (FG) (4FTX4FT-4FTX4FT)	EA	1
466	6097	HEADWALL (CH-PW-0) (DIA= 24 IN)	EA	1
496	6002	REMOVE STR (INLET)	EA	1
496	6006	REMOVE STR (HEADWALL)	EA	1
496	6007	REMOVE STR (PIPE)	LF	78



CULVERT NO. 1 @ STA. 25+12.55

EXISTING: 1-24"X78' CMP WITH 90° BEND (DROP INLET (US) AND CHII-B (DS) (TO BE REMOVED)

PROPOSED: 1-24"x80' CL III RCP
1-4'x4' PRECAST JUNCTION BOX (PJB) WITH 1-PRECAST AREA ZONE DRAIN (STYLE FG) (4'X4') (UP)
1- CH-PW-0 (DS)

DATE TIME
DOCUMENT NAME

STATE OF TEXAS
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02/27/2023

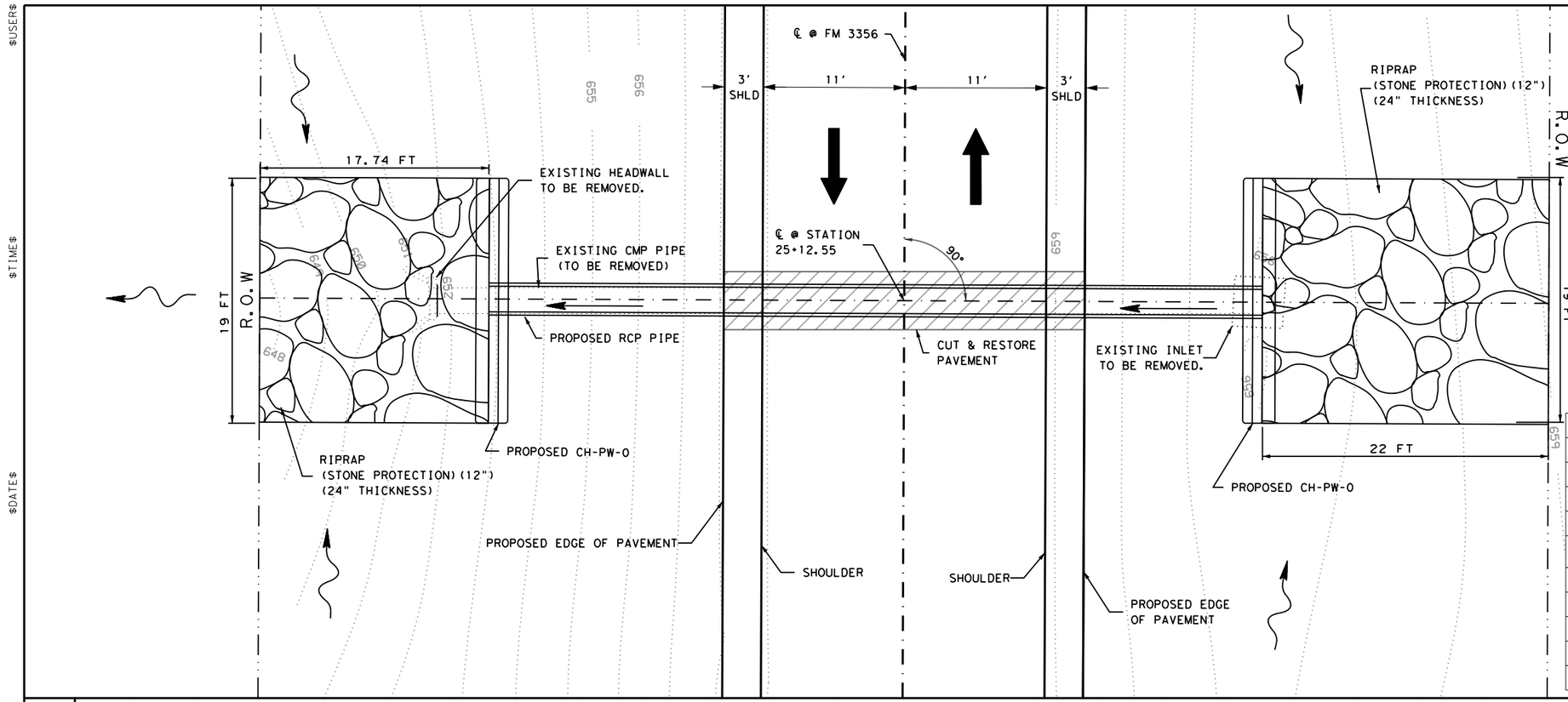
Texas Department of Transportation

FM 3356
CULVERT NO. 1 LAYOUT AT STA 25+12.55

SCALE: 1"=10'-H
1"=10'-V

SHEET 1 OF 10

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CS	TEXAS	DALLAS	COLLIN	
CHECK MS	CONTROL	SECTION	JOB	
CHECK JRV	3427	03	007	64



HYDRAULIC DATA

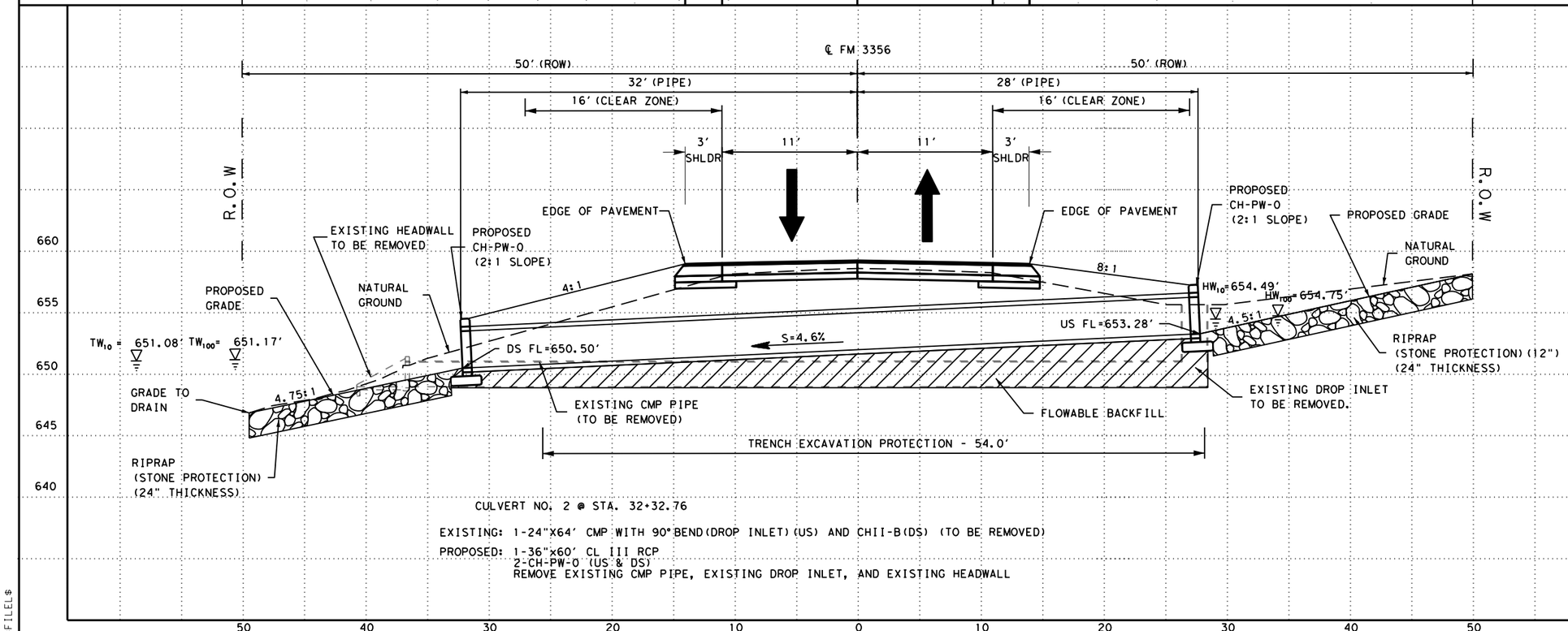
DRAINAGE AREA = 3 ACRES

Q_{10}	= 8.43 CFS	Q_{100}	= 12.11 CFS
HW_{10}	= 654.49′	HW_{100}	= 654.75′
TW_{10}	= 651.08′	TW_{100}	= 651.17′
V_{10}	= 10.39 FT/S	V_{100}	= 11.85 FT/S

0 2 4 6 8 10
SCALE IN FEET

CULVERT 2

ITEM NUMBER		ITEM DESCRIPTION	UNIT	QUANTITY
400	6005	CEM STABIL BKFL	CY	23
400	6008	CUT & RESTORING ASPH PAVING	SY	14
401	6001	FLOWABLE BACKFILL	CY	27
402	6001	TRENCH EXCAVATION PROTECTION	LF	54
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	CY	57
464	6008	RC PIPE (CL III) (36 IN)	LF	60
466	6134	HEADWALL (CH-PW-S) (DIA= 36 IN)	EA	2
496	6002	REMOVE STR (INLET)	EA	1
496	6006	REMOVE STR (HEADWALL)	EA	1
496	6007	REMOVE STR (PIPE)	LF	64



CULVERT NO. 2 @ STA. 32+32.76

EXISTING: 1-24"X64' CMP WITH 90° BEND (DROP INLET) (US) AND CHII-B (DS) (TO BE REMOVED)

PROPOSED: 1-36"x60' CL III RCP
2-CH-PW-0 (US & DS)
REMOVE EXISTING CMP PIPE, EXISTING DROP INLET, AND EXISTING HEADWALL

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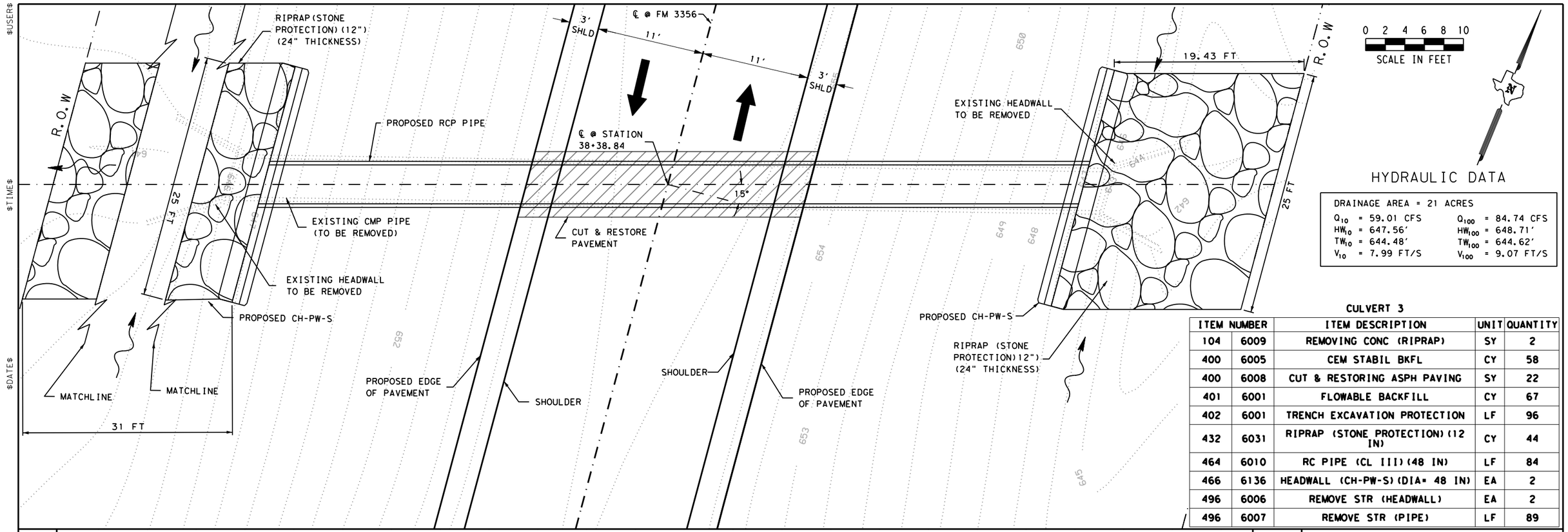
FM 3356
CULVERT NO. 2 LAYOUT AT STA 32+32.76

SCALE: 1"=10'-H
1"=10'-V

SHEET 2 OF 10

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	65
	3427	03	007	



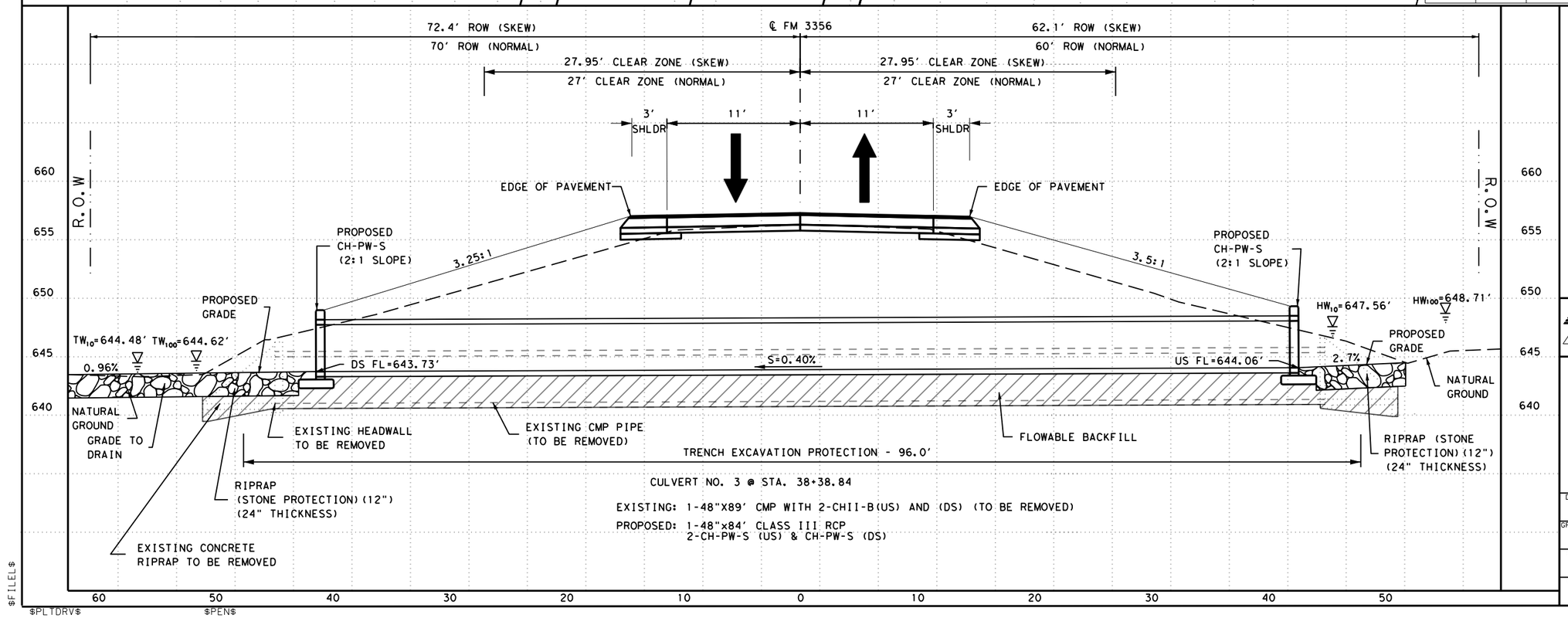
HYDRAULIC DATA

DRAINAGE AREA = 21 ACRES

Q_{10}	= 59.01 CFS	Q_{100}	= 84.74 CFS
HW_{10}	= 647.56'	HW_{100}	= 648.71'
TW_{10}	= 644.48'	TW_{100}	= 644.62'
V_{10}	= 7.99 FT/S	V_{100}	= 9.07 FT/S

CULVERT 3

ITEM NUMBER		ITEM DESCRIPTION	UNIT	QUANTITY
104	6009	REMOVING CONC (RIPRAP)	SY	2
400	6005	CEM STABIL BKFL	CY	58
400	6008	CUT & RESTORING ASPH PAVING	SY	22
401	6001	FLOWABLE BACKFILL	CY	67
402	6001	TRENCH EXCAVATION PROTECTION	LF	96
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	CY	44
464	6010	RC PIPE (CL III) (48 IN)	LF	84
466	6136	HEADWALL (CH-PW-S) (DIA= 48 IN)	EA	2
496	6006	REMOVE STR (HEADWALL)	EA	2
496	6007	REMOVE STR (PIPE)	LF	89



CULVERT NO. 3 @ STA. 38+38.84

EXISTING: 1-48"X89' CMP WITH 2-CHII-B(US) AND (DS) (TO BE REMOVED)

PROPOSED: 1-48"x84' CLASS III RCP
2-CH-PW-S (US) & CH-PW-S (DS)

STATE OF TEXAS
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02/03/2023

Texas Department of Transportation

FM 3356
CULVERT NO. 3 LAYOUT AT STA 38+38.84

SCALE: 1"=10'-H
1"=10'-V

SHEET 3 OF 10

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6			FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CS	TEXAS	DALLAS	COLLIN	
CHECK MS	CONTROL	SECTION	JOB	66
CHECK JRV	3427	03	007	

$USER$ $TIME$ $DATE$ $FILEL$ $PLTDRV$ PEN

$USER$

$TIME$

$DATE$

RIPRAP (STONE PROTECTION) (12") (24" THICKNESS)

EXISTING HEADWALL TO BE REMOVED

3' SHLD | 11' | 11' | 3' SHLD

℄ @ FM 3356

90°

PROPOSED RCP PIPE

EXISTING CMP PIPE (TO BE REMOVED)

℄ @ STATION 49+59.64

CUT & RESTORE PAVEMENT

19 FT R.O.W

19.61 FT

PROPOSED CH-PW-O

PROPOSED EDGE OF PAVEMENT

SHOULDER

SHOULDER

PROPOSED EDGE OF PAVEMENT

20.11 FT

19 FT R.O.W

PROPOSED CH-PW-O

RIPRAP (STONE PROTECTION) (12") (24" THICKNESS)

HYDRAULIC DATA

DRAINAGE AREA = 5 ACRES

Q_{10}	= 14.05 CFS	Q_{100}	= 20.18 CFS
HW_{10}	= 661.27'	HW_{100}	= 662.02'
TW_{10}	= 659.40'	TW_{100}	= 659.49'
V_{10}	= 6.24 FT/S	V_{100}	= 7.44 FT/S

0 2 4 6 8 10

SCALE IN FEET

N

CULVERT 4

ITEM	NUMBER	ITEM DESCRIPTION	UNIT	QUANTITY
400	6005	CEM STABIL BKFL	CY	43
400	6008	CUT & RESTORING ASPH PAVING	SY	14
402	6001	TRENCH EXCAVATION PROTECTION	LF	37
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	CY	56
464	6005	RC PIPE (CL III) (24 IN)	LF	60
466	6097	HEADWALL (CH-PW-O) (DIA= 24 IN)	EA	2
496	6006	REMOVE STR (HEADWALL)	EA	2
496	6007	REMOVE STR (PIPE)	LF	58

℄ FM 3356

50' (ROW) | 50' (ROW)

16' (CLEAR ZONE) | 16' (CLEAR ZONE)

3' SHLDR | 11' | 11' | 3' SHLDR

R.O.W | R.O.W

PROPOSED CH-PW-O (2:1 SLOPE)

EDGE OF PAVEMENT | EDGE OF PAVEMENT

EXISTING HEADWALL TO BE REMOVED

PROPOSED CH-PW-O (2:1 SLOPE)

PROPOSED GRADE

EXISTING HEADWALL TO BE REMOVED

3:1 | 3.75:1

NATURAL GROUND

TW_{10}=659.30' TW_{100}=659.37' PROPOSED GRADE

1.8%

S=0.30%

2.2%

NATURAL GROUND

HW_{10}=661.27' HW_{100} =662.02'

GRADE TO DRAIN

DS FL=658.80'

PROPOSED RCP PIPE

US FL=659.05'

RIPRAP (STONE PROTECTION) (12") (24" THICKNESS)

RIPRAP (STONE PROTECTION) (12") (24" THICKNESS)

EXISTING CMP PIPE (TO BE REMOVED)

TRENCH EXCAVATION PROTECTION - 37.0'

665 | 660 | 655 | 650 | 645

50 40 30 20 10 0 10 20 30 40 50 60

CULVERT NO. 4 @ STA. 49+59.79

EXISTING: 1-24"X58' CMP WITH 2-CHII-B(US & DS) (TO BE REMOVED)

PROPOSED: 1-24"x60' CL III RCP
CH-PW-O (US) & CH-PW-O (DS)

$FILE1$

$PLTDRV$ PEN

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
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02/03/2023

Texas Department of Transportation

FM 3356

CULVERT NO. 4 LAYOUT AT STA 49+59.64

SCALE: 1"=10'-H
1"=10'-V

SHEET 4 OF 10

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	67
	3427	03	007	

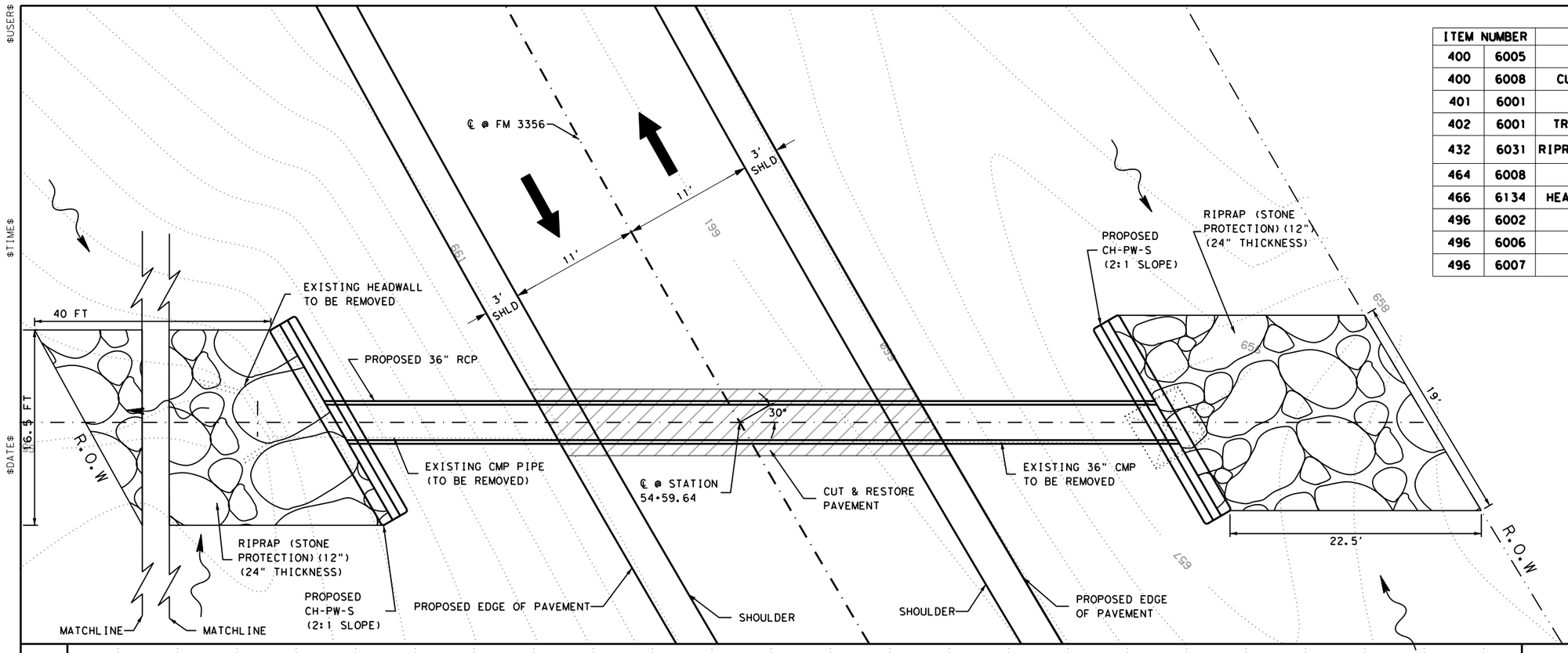
$USER$

$TIME$

$DATE$

CULVERT 5

ITEM	NUMBER	ITEM DESCRIPTION	UNIT	QUANTITY
400	6005	CEM STABIL BKFL	CY	34
400	6008	CUT & RESTORING ASPH PAVING	SY	21
401	6001	FLOWABLE BACKFILL	CY	57
402	6001	TRENCH EXCAVATION PROTECTION	LF	75
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	CY	77
464	6008	RC PIPE (CL III) (36 IN)	LF	70
466	6134	HEADWALL (CH-PW-S) (DIA= 36 IN)	EA	2
496	6002	REMOVE STR (INLET)	EA	1
496	6006	REMOVE STR (HEADWALL)	EA	1
496	6007	REMOVE STR (PIPE)	LF	76



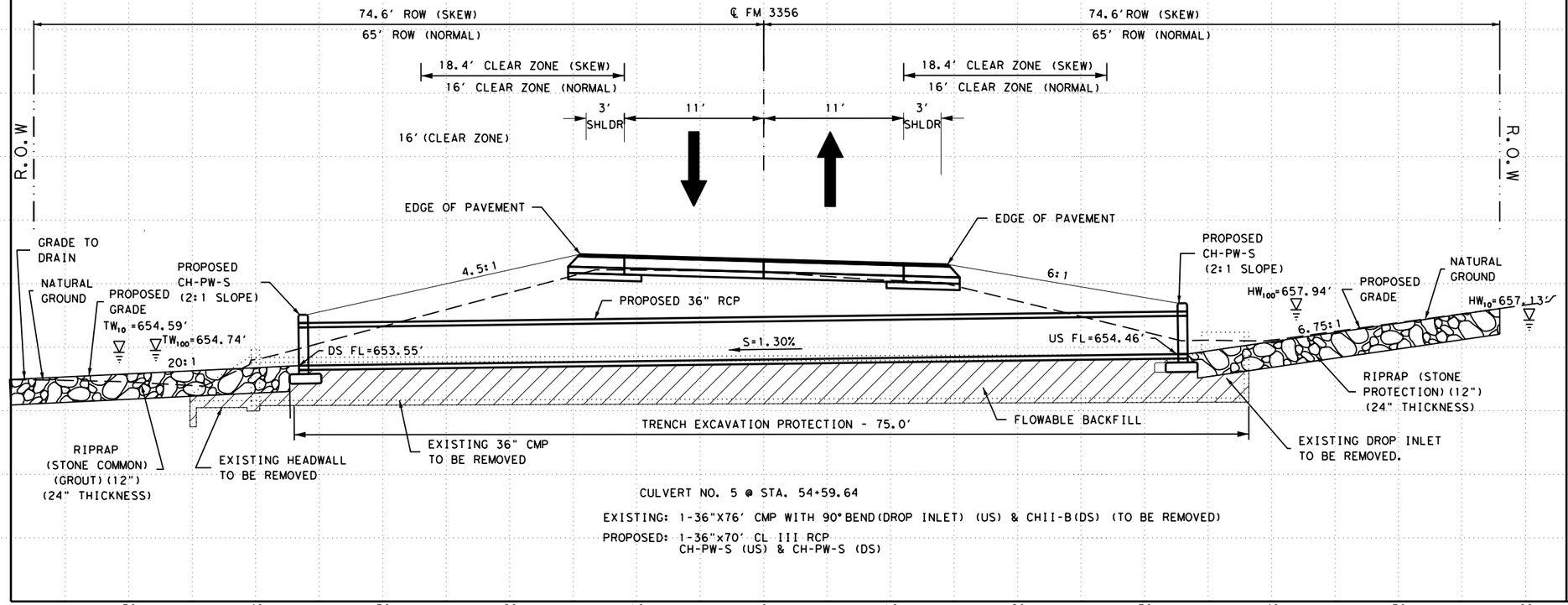
HYDRAULIC DATA

DRAINAGE AREA = 12 ACRES

Q_{10}	= 29.82 CFS	Q_{100}	= 43.06 CFS
HW_{10}	= 657.13'	HW_{100}	= 657.94'
TW_{10}	= 654.59'	TW_{100}	= 654.74'
V_{10}	= 9.81 FT/S	V_{100}	= 10.72 FT/S

0 2 4 6 8 10

SCALE IN FEET



CULVERT NO. 5 @ STA. 54+59.64

EXISTING: 1-36"X76' CMP WITH 90°BEND(DROP INLET) (US) & CHII-B(DS) (TO BE REMOVED)

PROPOSED: 1-36"x70' CL III RCP
CH-PW-S (US) & CH-PW-S (DS)

50 40 30 20 10 0 10 20 30 40 50 60

$FILE$

$PLTDRV$ PEN

STATE OF TEXAS
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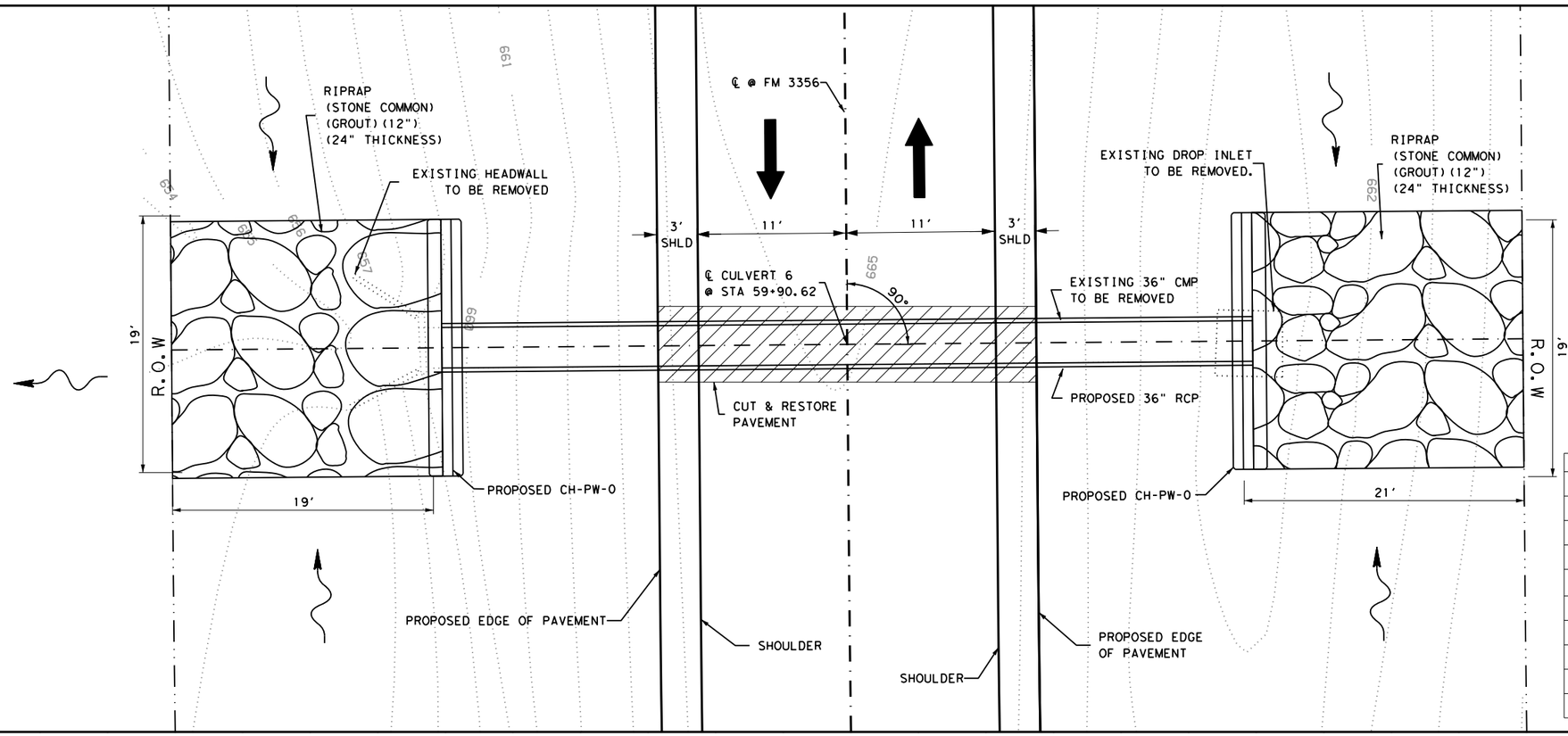
02/03/2023

Texas Department of Transportation

FM 3356
CULVERT NO. 5 LAYOUT AT STA 54+59.64

SCALE: 1"=10'-H
1"=10'-V

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CS	TEXAS	DALLAS	COLLIN	
CHECK	CONTROL	SECTION	JOB	
MS	3427	03	007	68
CHECK				
JRV				



0 2 4 6 8 10
SCALE IN FEET

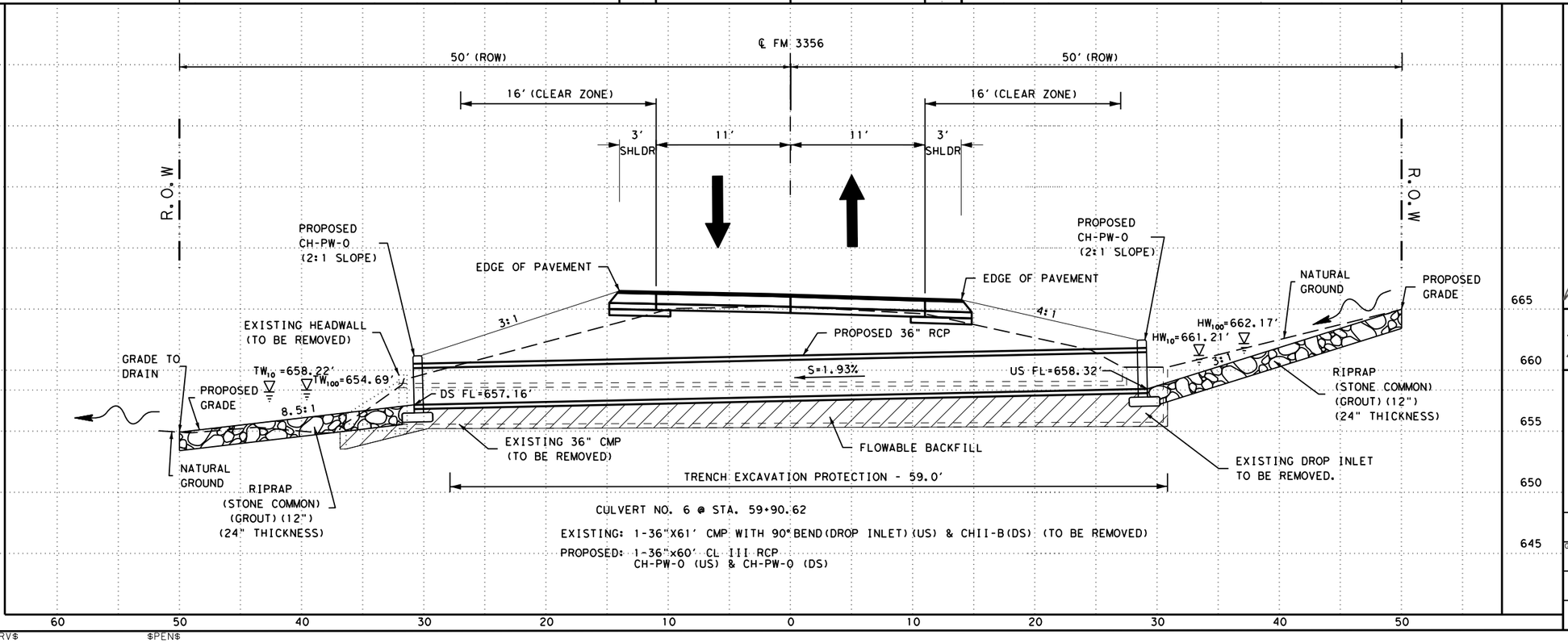
HYDRAULIC DATA

DRAINAGE AREA = 12 ACRES

Q_{10}	= 33.72 CFS	Q_{100}	= 48.42 CFS
HW_{10}	= 661.21′	HW_{100}	= 662.17′
TW_{10}	= 658.22′	TW_{100}	= 658.37′
V_{10}	= 11.13 FT/S	V_{100}	= 12.08 FT/S

CULVERT 6

ITEM NUMBER		ITEM DESCRIPTION	UNIT	QUANTITY
400	6005	CEM STABIL BKFL	CY	43
400	6008	CUT & RESTORING ASPH PAVING	SY	18
401	6001	FLOWABLE BACKFILL	CY	29
402	6001	TRENCH EXCAVATION PROTECTION	LF	59
432	6031	RIPRAP (STONE PROTECTION)(12 IN)	CY	57
464	6008	RC PIPE (CL III)(36 IN)	LF	60
466	6101	HEADWALL (CH-PW-0)(DIA= 36 IN)	EA	2
496	6002	REMOVE STR (INLET)	EA	1
496	6006	REMOVE STR (HEADWALL)	EA	1
496	6007	REMOVE STR (PIPE)	LF	61



CULVERT NO. 6 @ STA. 59+90.62

EXISTING: 1-36"X61′ CMP WITH 90° BEND(DROP INLET)(US) & CHII-B(DS) (TO BE REMOVED)

PROPOSED: 1-36"x60′ CL III RCP
CH-PW-0 (US) & CH-PW-0 (DS)

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

FM 3356
CULVERT NO. 6 LAYOUT
STA 59+90.62

SCALE: 1"=10′-H
1"=10′-V

SHEET 6 OF 10

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	69
	3427	03	007	

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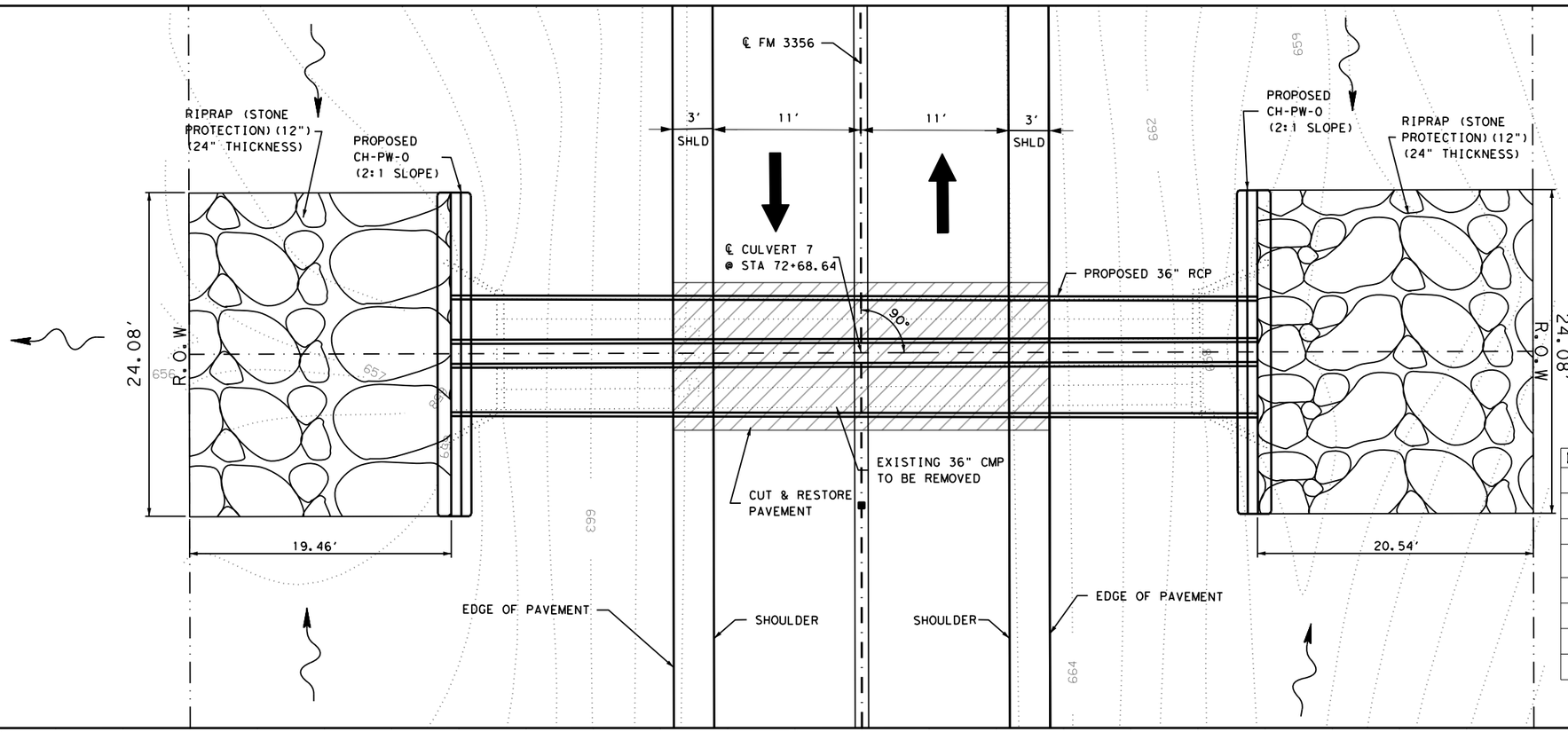
DATE TIME
$FILE$ DOCUMENT NAME
$PLTDRV$ $PENS$



0 2 4 6 8 10
SCALE IN FEET

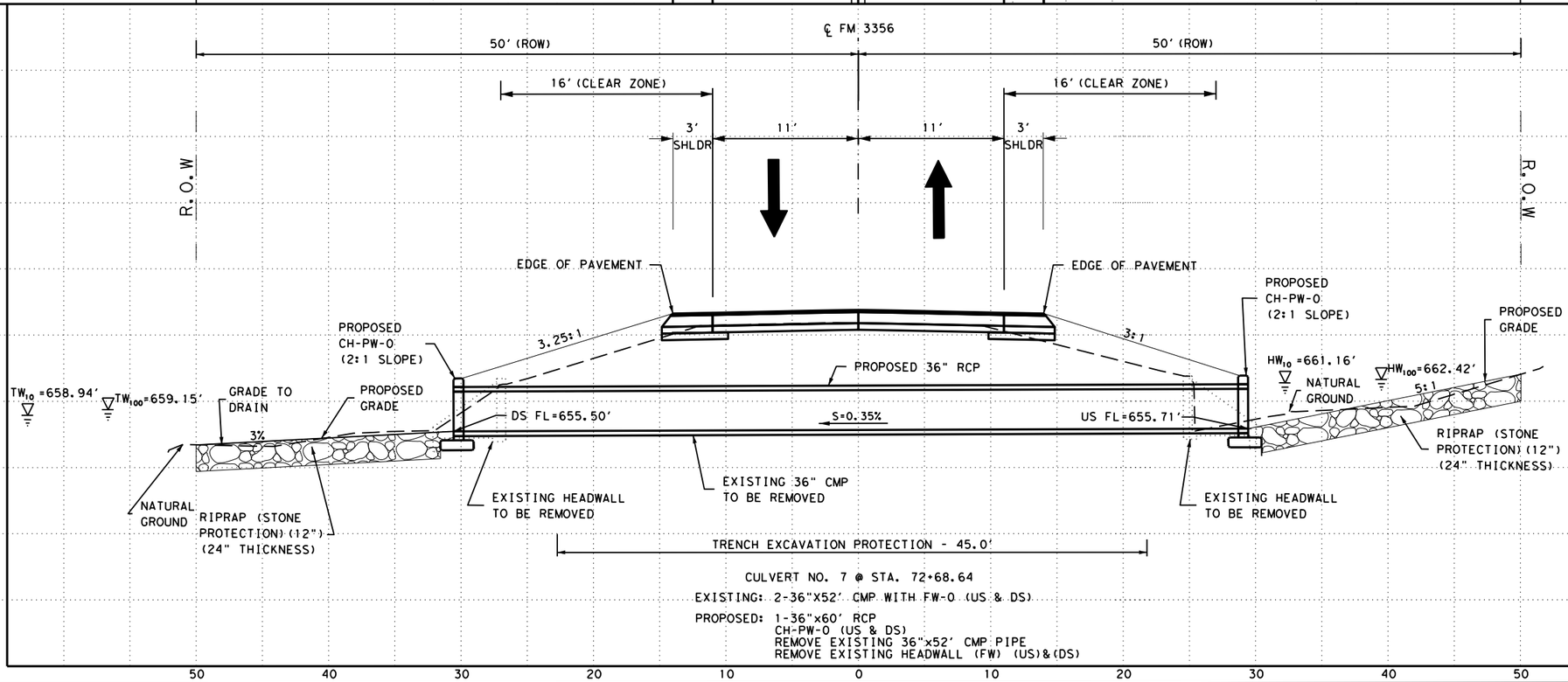
HYDRAULIC DATA

DRAINAGE AREA = 18 ACRES

Q_{10} = 81.49 CFS		Q_{100} = 117.02 CFS	
HW_{10} = 661.16'		HW_{100} = 662.42'	
TW_{10} = 658.94'		TW_{100} = 659.15'	
V_{10} = 7.81 FT/S		V_{100} = 9.39 FT/S	

CULVERT 7

ITEM	NUMBER	ITEM DESCRIPTION	UNIT	QUANTITY
400	6005	CEM STABIL BKFL	CY	67
400	6008	CUT & RESTORING ASPH PAVING	SY	35
402	6001	TRENCH EXCAVATION PROTECTION	LF	45
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	CY	71
464	6008	RC PIPE (CL III) (36 IN)	LF	120
466	6101	HEADWALL (CH-PW-0) (DIA= 36 IN)	EA	2
496	6006	REMOVE STR (HEADWALL)	EA	2
496	6007	REMOVE STR (PIPE)	LF	104



CULVERT NO. 7 @ STA. 72+68.64
EXISTING: 2-36"x52' CMP WITH FW-0 (US & DS)
PROPOSED: 1-36"x60' RCP
CH-PW-0 (US & DS)
REMOVE EXISTING 36"x52' CMP PIPE
REMOVE EXISTING HEADWALL (FW) (US)&(DS)

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
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02/03/2023

Texas Department of Transportation

FM 3356
CULVERT 7 LAYOUT
STA 72+68.64

SCALE: 1"=10'-H
1"=10'-V

SHEET 7 OF 10

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	70
	3427	03	007	

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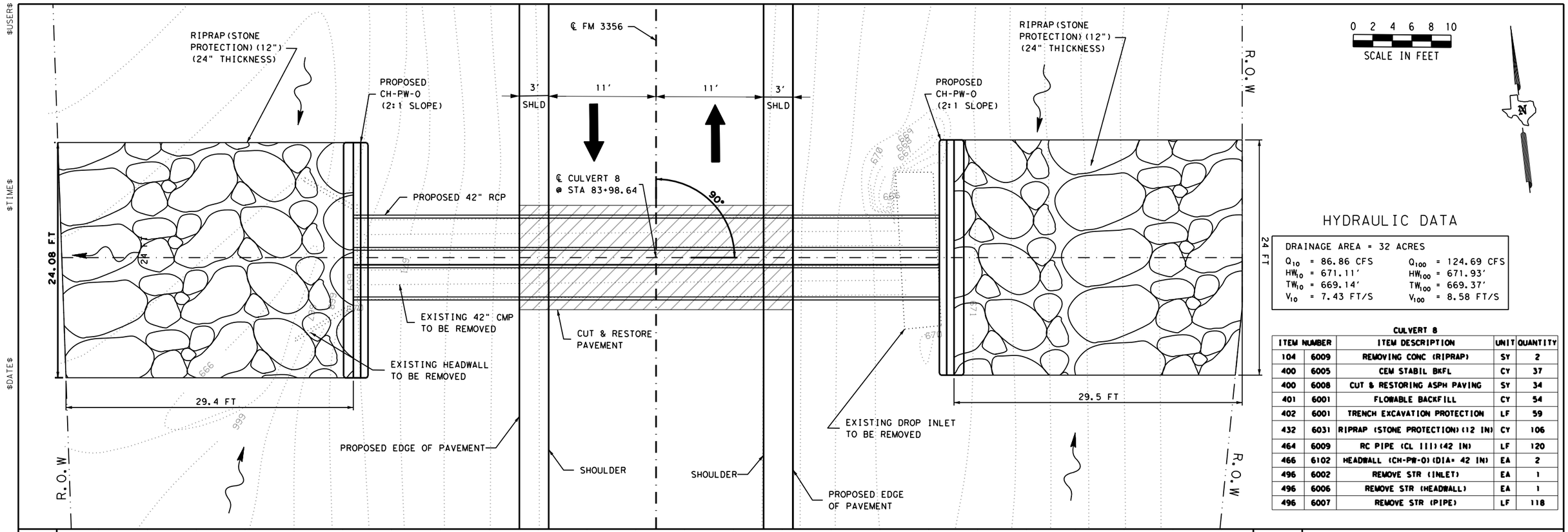
DATE TIME
DOCUMENT NAME
$FILE$
$PLTDRV$
PEN



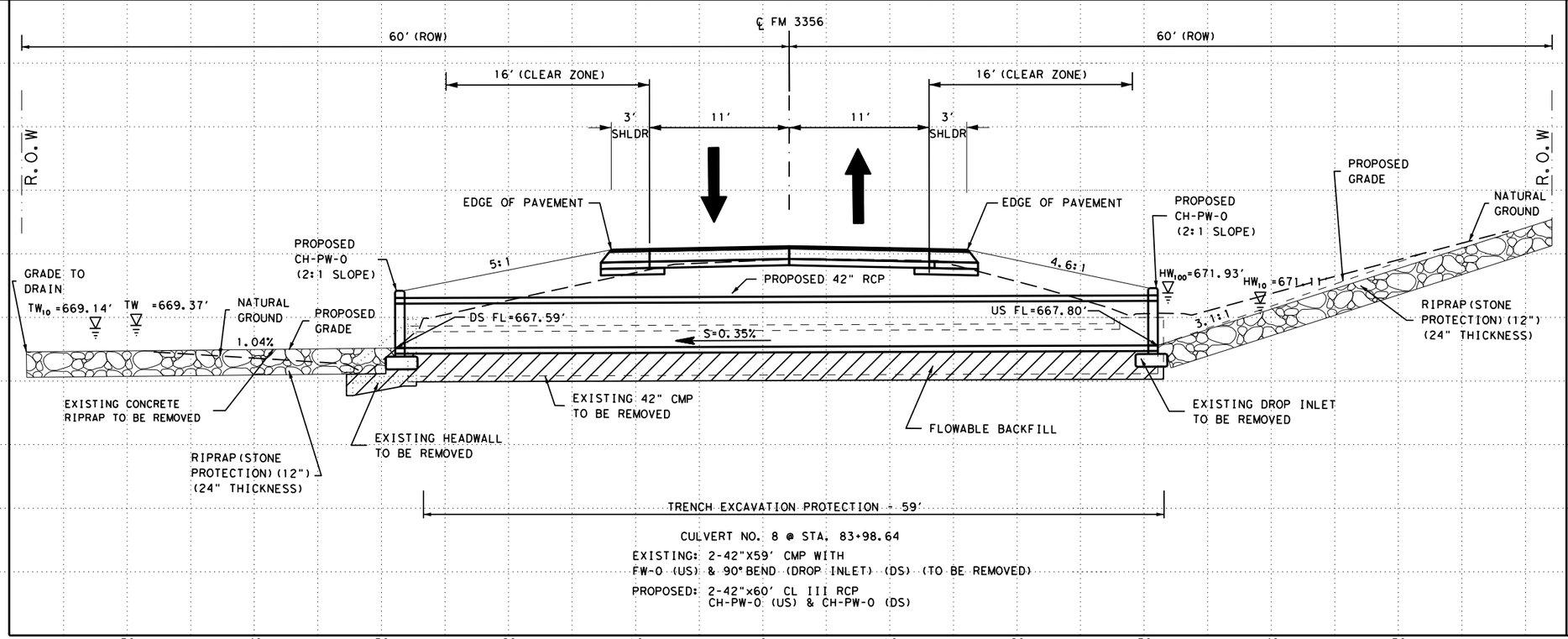
HYDRAULIC DATA

DRAINAGE AREA = 32 ACRES

Q_{10}	= 86.86 CFS	Q_{100}	= 124.69 CFS
HW_{10}	= 671.11'	HW_{100}	= 671.93'
TW_{10}	= 669.14'	TW_{100}	= 669.37'
V_{10}	= 7.43 FT/S	V_{100}	= 8.58 FT/S

CULVERT 8

ITEM NUMBER		ITEM DESCRIPTION	UNIT	QUANTITY
104	6009	REMOVING CONC (RIPRAP)	SY	2
400	6005	CEM STABIL BKFL	CY	37
400	6008	CUT & RESTORING ASPH PAVING	SY	34
401	6001	FLOWABLE BACKFILL	CY	54
402	6001	TRENCH EXCAVATION PROTECTION	LF	59
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	CY	106
464	6009	RC PIPE (CL III) (42 IN)	LF	120
466	6102	HEADWALL (CH-PW-0) (DIA= 42 IN)	EA	2
496	6002	REMOVE STR (INLET)	EA	1
496	6006	REMOVE STR (HEADWALL)	EA	1
496	6007	REMOVE STR (PIPE)	LF	118



CULVERT NO. 8 @ STA. 83+98.64

EXISTING: 2-42"X59' CMP WITH FW-0 (US) & 90° BEND (DROP INLET) (DS) (TO BE REMOVED)

PROPOSED: 2-42"x60' CL III RCP CH-PW-0 (US) & CH-PW-0 (DS)

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED PROFESSIONAL ENGINEER

02/03/2023

Texas Department of Transportation

FM 3356
CULVERT 8 LAYOUT
STA 83+98.64

SCALE: 1"=10'-H
1"=10'-V

SHEET 8 OF 10

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	71
	3427	03	007	

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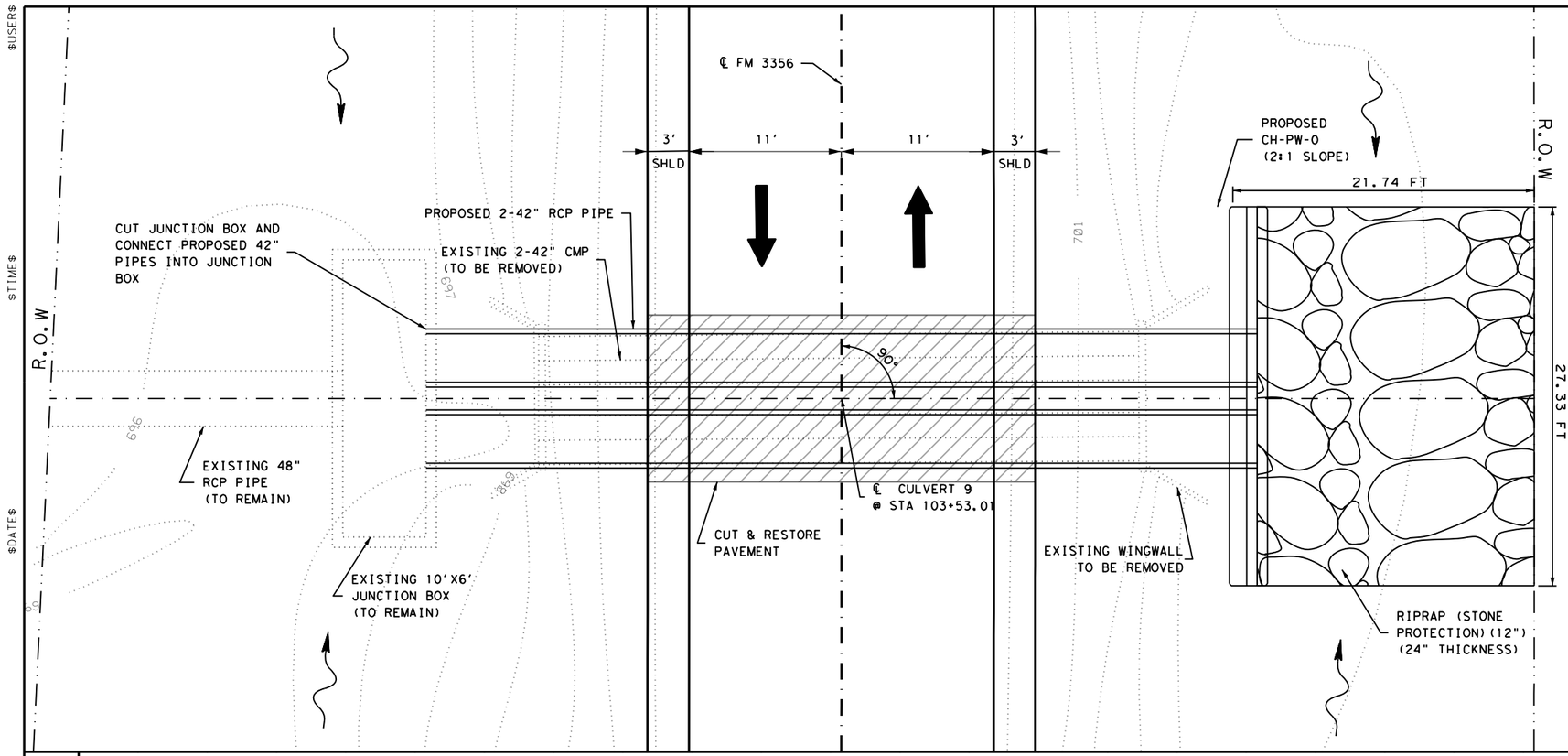
DATE TIME
$FILE$ DOCUMENT NAME
$PLTDRV$ PEN



0 2 4 6 8 10
SCALE IN FEET

HYDRAULIC DATA

DRAINAGE AREA = 28 ACRES

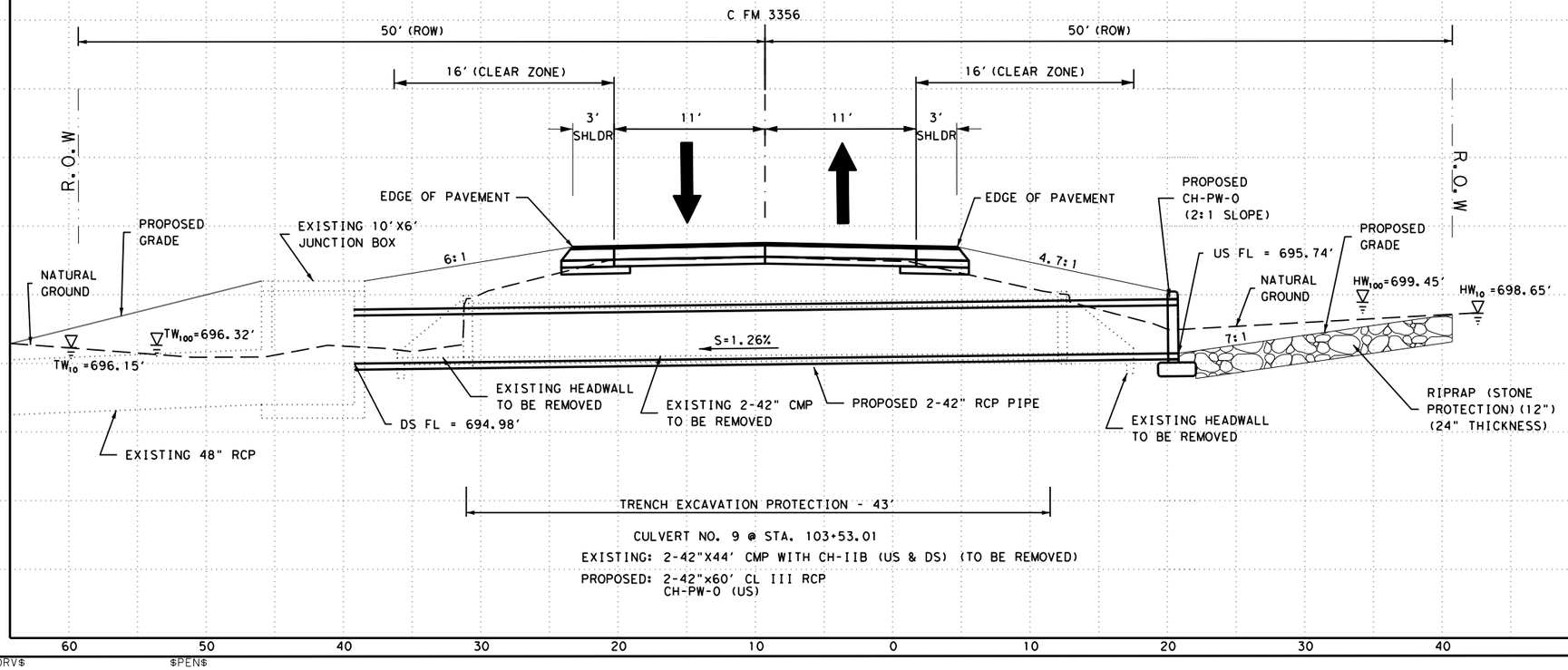
Q_{10}	= 78.68 CFS	Q_{100}	= 112.98 CFS
HW_{10}	= 698.65'	HW_{100}	= 699.45'
TW_{10}	= 696.15'	TW_{100}	= 696.32'
V_{10}	= 9.62 FT/S	V_{100}	= 10.53 FT/S

CULVERT 9

ITEM NUMBER		ITEM DESCRIPTION	UNIT	QUANTITY
400	6005	CEM STABIL BKFL	CY	76
400	6008	CUT & RESTORING ASPH PAVING	SY	38
402	6001	TRENCH EXCAVATION PROTECTION	LF	43
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	CY	41
464	6009	RC PIPE (CL III) (42 IN)	LF	120
466	6102	HEADWALL (CH-PW-0) (DIA= 42 IN)	EA	1
496	6006	REMOVE STR (HEADWALL)	EA	1
496	6007	REMOVE STR (PIPE)	LF	88

NOTES:

1. TIE PROPOSED 42" PIPES INTO EXISTING 10'X6' JUNCTION BOX.



STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
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PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

FM 3356
CULVERT 9 LAYOUT
STA 103+53.01

SCALE: 1"=10'-H
1"=10'-V

SHEET 9 OF 10

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	72
	3427	03	007	

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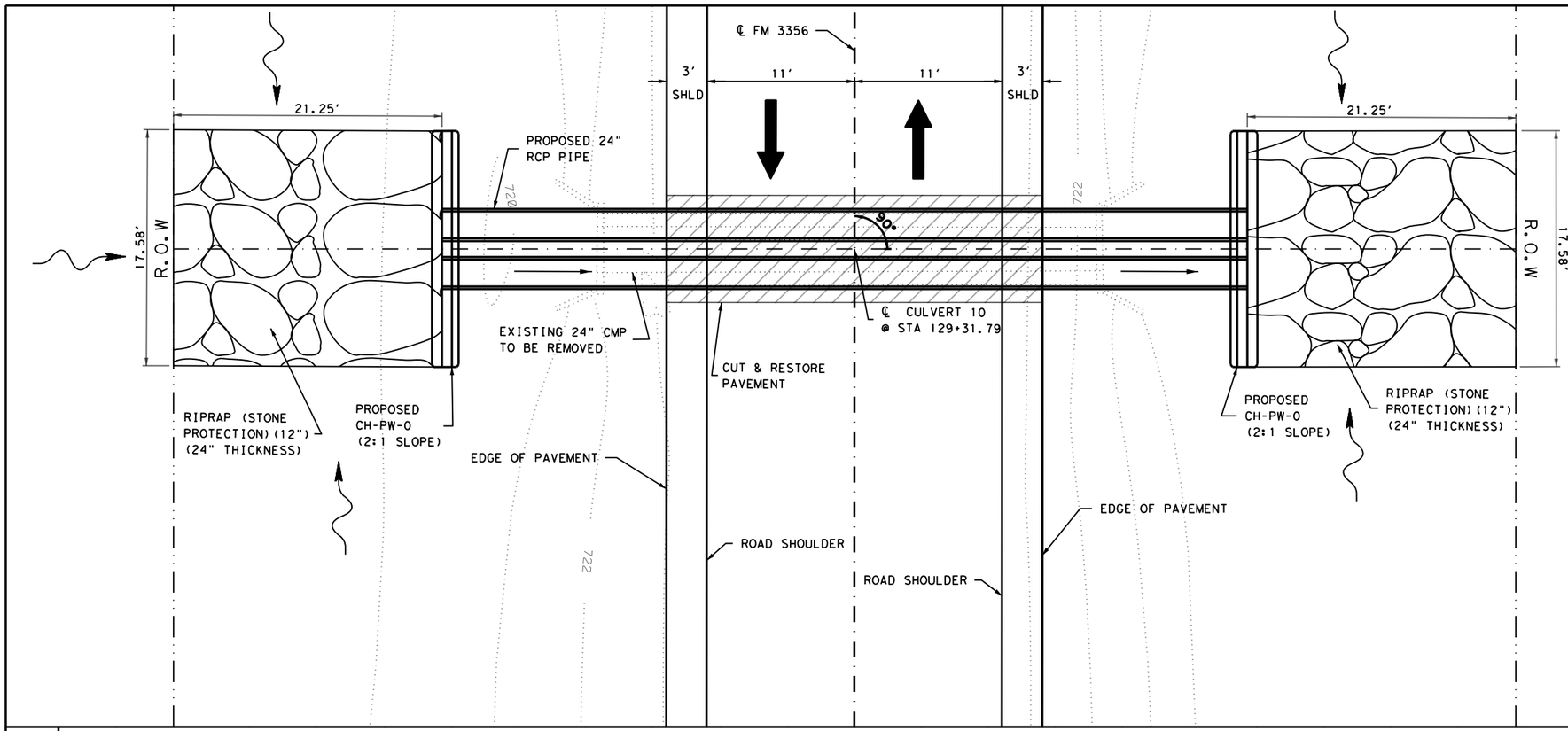
$TIME$
$DATE$
DATE TIME
$FILE$ DOCUMENT NAME
$PLTDRV$
PEN



0 2 4 6 8 10
SCALE IN FEET

N

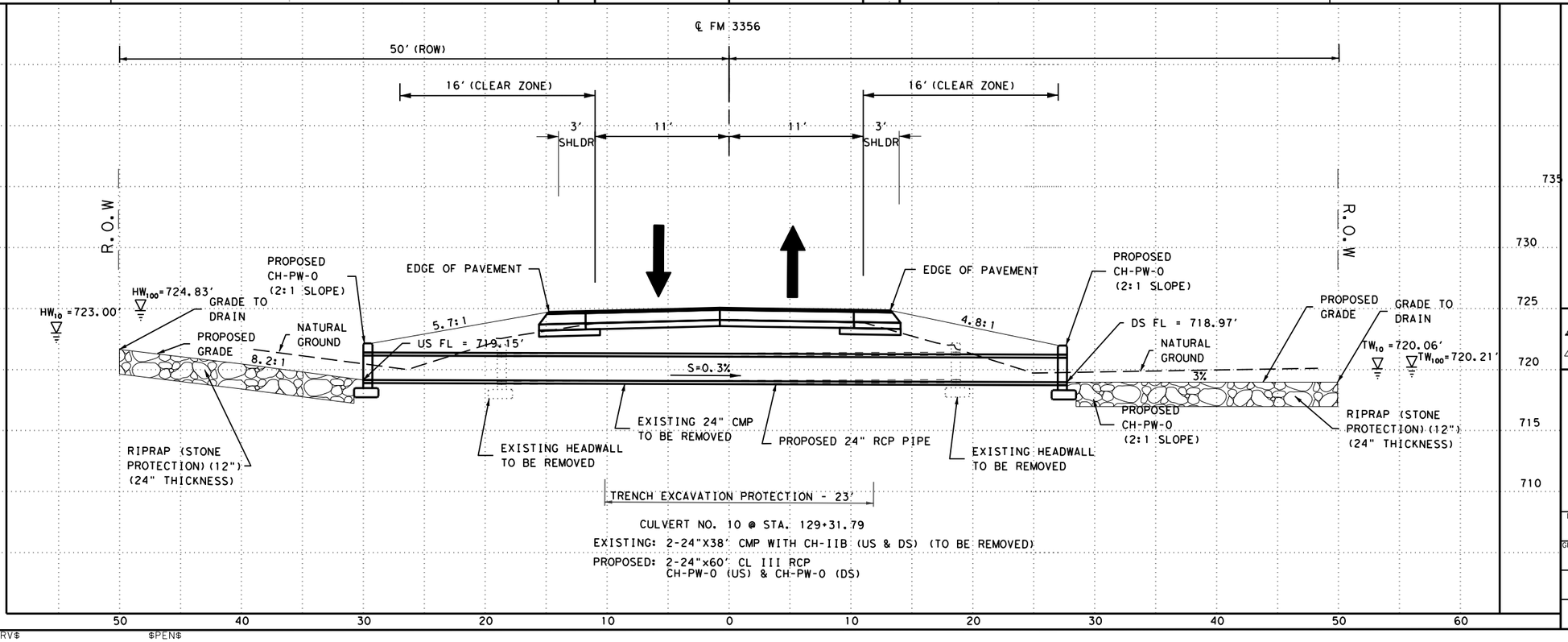
HYDRAULIC DATA

DRAINAGE AREA = 18 ACRES

Q_{10} = 50.00 CFS		Q_{100} = 71.84 CFS	
HW_{10} = 723.00'		HW_{100} = 724.83'	
TW_{10} = 720.06'		TW_{100} = 720.21'	
V_{10} = 8.53 FT/S		V_{100} = 10.66 FT/S	

CULVERT 10

ITEM NUMBER		ITEM DESCRIPTION	UNIT	QUANTITY
104	6009	REMOVING CONC (RIPRAP)	SY	3
400	6005	CEM STABIL BKFL	CY	44
400	6008	CUT & RESTORING ASPH PAVING	SY	25
402	6001	TRENCH EXCAVATION PROTECTION	LF	23
432	6031	RIPRAP (STONE PROTECTION) (12 IN)	CY	53
464	6005	RC PIPE (CL III) (24 IN)	LF	120
466	6097	HEADWALL (CH-PW-0) (DIA= 24 IN)	EA	2
496	6006	REMOVE STR (HEADWALL)	EA	2
496	6007	REMOVE STR (PIPE)	LF	76



CULVERT NO. 10 @ STA. 129+31.79

EXISTING: 2-24"X38' CMP WITH CH-IIB (US & DS) (TO BE REMOVED)

PROPOSED: 2-24"x60' CL III RCP
CH-PW-0 (US) & CH-PW-0 (DS)

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

FM 3356
CULVERT 10 LAYOUT
STA 129+31.79

SCALE: 1"=10'-H
1"=10'-V

SHEET 10 OF 10

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	73
	3427	03	007	

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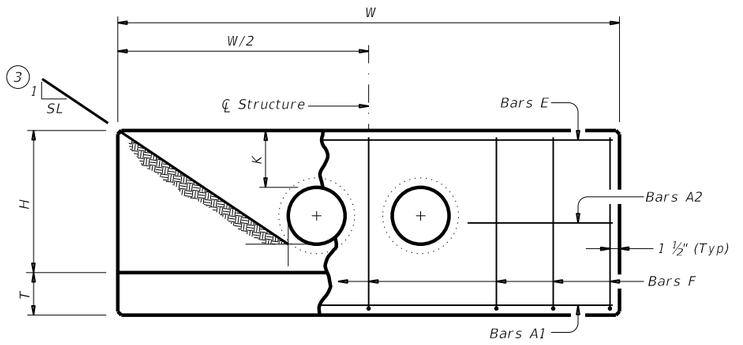
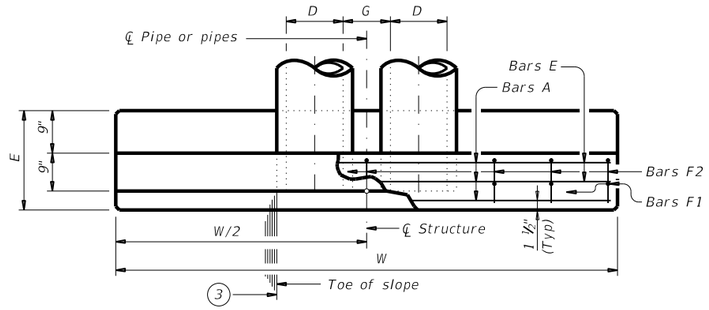
DATE TIME
$FILE$ DOCUMENT NAME
$PLTDRV$ PEN

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

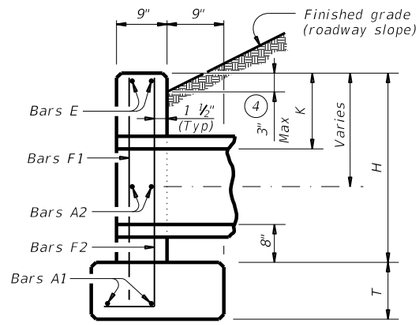
Slope	Dia of Pipe (D)	Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' – 0"	122	1.1	1' – 9"	15	0.2
	15"	10' – 3"	136	1.3	2' – 2"	16	0.2
	18"	11' – 6"	163	1.5	2' – 8"	19	0.3
	21"	12' – 9"	200	1.8	3' – 1"	31	0.4
	24"	14' – 0"	217	2.1	3' – 7"	34	0.4
	27"	15' – 3"	254	2.4	3' – 11"	37	0.5
	30"	16' – 6"	272	2.7	4' – 4"	40	0.6
	33"	17' – 9"	314	3.1	4' – 8"	43	0.6
	36"	19' – 0"	371	3.9	5' – 1"	46	0.8
	42"	21' – 6"	442	4.9	5' – 10"	52	1.0
	48"	25' – 0"	569	6.4	6' – 7"	59	1.3
	54"	27' – 6"	701	7.5	7' – 6"	82	1.6
	60"	30' – 0"	794	8.8	8' – 3"	90	1.8
	66"	32' – 6"	894	10.2	8' – 9"	96	2.0
	72"	35' – 0"	1,055	11.7	9' – 4"	103	2.3
3:1	12"	13' – 0"	175	1.6	1' – 9"	14	0.2
	15"	14' – 9"	193	1.9	2' – 2"	17	0.2
	18"	16' – 6"	228	2.2	2' – 8"	19	0.3
	21"	18' – 3"	299	2.6	3' – 1"	31	0.4
	24"	20' – 0"	323	3.0	3' – 7"	33	0.4
	27"	21' – 9"	371	3.5	3' – 11"	37	0.5
	30"	23' – 6"	415	4.0	4' – 4"	40	0.5
	33"	25' – 3"	469	4.6	4' – 8"	43	0.6
	36"	27' – 0"	556	5.7	5' – 1"	46	0.8
	42"	30' – 6"	675	7.1	5' – 10"	52	1.0
	48"	35' – 6"	837	9.2	6' – 7"	59	1.3
	54"	39' – 0"	1,015	11.0	7' – 6"	84	1.6
	60"	42' – 6"	1,171	12.9	8' – 3"	91	1.8
	66"	46' – 0"	1,298	14.9	8' – 9"	98	2.0
	72"	49' – 6"	1,561	17.1	9' – 4"	103	2.3
4:1	12"	17' – 0"	229	2.0	1' – 9"	15	0.2
	15"	19' – 3"	266	2.4	2' – 2"	17	0.2
	18"	21' – 6"	308	2.9	2' – 8"	19	0.3
	21"	23' – 9"	382	3.5	3' – 1"	31	0.3
	24"	26' – 0"	430	3.9	3' – 7"	34	0.4
	27"	28' – 3"	486	4.7	3' – 11"	37	0.5
	30"	30' – 6"	539	5.2	4' – 4"	40	0.6
	33"	32' – 9"	603	6.0	4' – 8"	42	0.6
	36"	35' – 0"	738	7.5	5' – 1"	47	0.8
	42"	39' – 6"	881	9.3	5' – 10"	52	1.0
	48"	46' – 0"	1,102	12.1	6' – 7"	61	1.3
	54"	50' – 6"	1,364	14.4	7' – 6"	84	1.6
	60"	55' – 0"	1,547	16.9	8' – 3"	91	1.8
	66"	59' – 6"	1,741	19.5	8' – 9"	98	2.0
	72"	64' – 0"	2,077	22.4	9' – 4"	102	2.3
6:1	12"	25' – 0"	336	3.0	1' – 9"	14	0.2
	15"	28' – 3"	384	3.6	2' – 2"	17	0.2
	18"	31' – 6"	452	4.2	2' – 8"	19	0.3
	21"	34' – 9"	581	5.1	3' – 1"	31	0.4
	24"	38' – 0"	644	5.8	3' – 7"	34	0.4
	27"	41' – 3"	737	6.9	3' – 11"	37	0.5
	30"	44' – 6"	807	7.7	4' – 4"	39	0.6
	33"	47' – 9"	912	8.9	4' – 8"	44	0.6
	36"	51' – 0"	1,108	11.0	5' – 1"	48	0.8
	42"	57' – 6"	1,318	13.7	5' – 10"	54	1.0
	48"	67' – 0"	1,682	17.9	6' – 7"	59	1.3
	54"	73' – 6"	2,072	21.3	7' – 6"	83	1.6
	60"	80' – 0"	2,351	24.9	8' – 3"	89	1.8
	66"	86' – 6"	2,643	28.9	8' – 9"	96	2.0
	72"	93' – 0"	3,121	33.1	9' – 4"	101	2.3



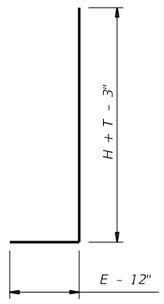
ELEVATION



PLAN OF NON-SKEWED PIPES



SECTION AT CENTER OF PIPE



BARS F2

(1) Total quantities include one 3'–1" lap for bars over 60' in length.

(2) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(3) Indicated slope is perpendicular to centerline pipe or pipes.

(4) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) Dimensions shown are usual and maximum.

(6) Quantities shown are for one structure end only (one headwall).

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' – 9"	1' – 0"	2' – 8"	0' – 9"	1' – 9"
15"	0' – 11"	1' – 0"	2' – 11"	0' – 9"	1' – 9"
18"	1' – 2"	1' – 0"	3' – 2"	0' – 9"	1' – 9"
21"	1' – 4"	1' – 0"	3' – 5"	0' – 9"	2' – 0"
24"	1' – 7"	1' – 0"	3' – 8"	0' – 9"	2' – 0"
27"	1' – 8"	1' – 0"	3' – 11"	0' – 9"	2' – 3"
30"	1' – 10"	1' – 0"	4' – 2"	0' – 9"	2' – 3"
33"	1' – 11"	1' – 0"	4' – 5"	0' – 9"	2' – 6"
36"	2' – 1"	1' – 0"	4' – 8"	1' – 0"	2' – 6"
42"	2' – 4"	1' – 0"	5' – 2"	1' – 0"	2' – 9"
48"	2' – 7"	1' – 3"	5' – 11"	1' – 0"	3' – 0"
54"	3' – 0"	1' – 3"	6' – 5"	1' – 0"	3' – 3"
60"	3' – 3"	1' – 3"	6' – 11"	1' – 0"	3' – 6"
66"	3' – 3"	1' – 3"	7' – 5"	1' – 0"	3' – 9"
72"	3' – 4"	1' – 3"	7' – 11"	1' – 0"	4' – 0"

TABLE OF REINFORCING STEEL (6)

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' – 6"	~
E	#5	~	2
F	#5	1' – 0"	~

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out–to–out of bars.

DATE: $DATE$ $TIME$
FILE: $FILE$

Texas Department of Transportation — Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED PIPE CULVERTS

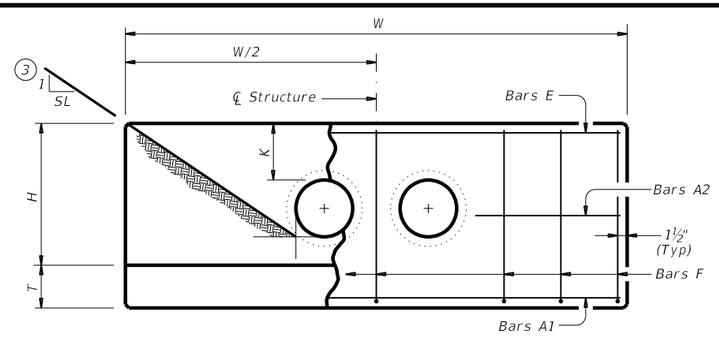
CH-PW-0

FILE: chpw0ste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		74

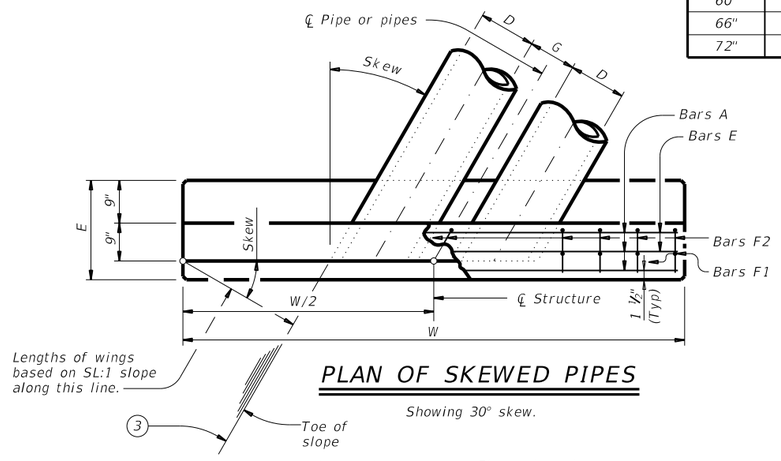
DATE: $DATE$ $TIME$
FILE: $FILE$

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	15° Skew						30° Skew						45° Skew					
		Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' – 4"	124	1.1	1' – 9 3/4"	15	0.2	10' – 5"	130	1.2	2' – 0"	16	0.2	12' – 9"	159	1.5	2' – 5 3/4"	17	0.3
	15"	10' – 7"	136	1.3	2' – 3"	17	0.2	11' – 10"	159	1.5	2' – 6"	18	0.2	14' – 6"	191	1.8	3' – 0 3/4"	20	0.3
	18"	11' – 11"	165	1.5	2' – 9"	19	0.3	13' – 3"	174	1.7	3' – 1"	29	0.3	16' – 3"	207	2.1	3' – 9 1/4"	33	0.4
	21"	13' – 2"	203	1.9	3' – 2 1/4"	31	0.4	14' – 9"	233	2.1	3' – 6 3/4"	33	0.4	18' – 0"	276	2.6	4' – 4 1/4"	36	0.5
	24"	14' – 6"	240	2.1	3' – 8 1/4"	34	0.4	16' – 2"	251	2.4	4' – 1 3/4"	36	0.5	19' – 10"	318	2.9	5' – 0 3/4"	39	0.6
	27"	15' – 9"	258	2.5	4' – 0 3/4"	38	0.5	17' – 7"	292	2.8	4' – 6 1/4"	39	0.6	21' – 7"	342	3.4	5' – 6 1/4"	44	0.7
	30"	17' – 1"	297	2.8	4' – 5 3/4"	40	0.6	19' – 1"	311	3.1	5' – 0"	42	0.6	23' – 4"	388	3.8	6' – 1 3/4"	47	0.8
	33"	18' – 5"	320	3.3	4' – 9 3/4"	43	0.6	20' – 6"	358	3.6	5' – 4 3/4"	46	0.7	25' – 1"	439	4.4	6' – 7 1/4"	51	0.9
	36"	19' – 8"	401	4.0	5' – 3"	47	0.9	21' – 11"	422	4.5	5' – 10 3/4"	50	0.9	26' – 10"	517	5.5	7' – 2 1/4"	55	1.2
	42"	22' – 3"	476	5.0	6' – 0 3/4"	53	1.1	24' – 10"	528	5.6	6' – 8 3/4"	56	1.2	30' – 5"	634	6.9	8' – 3"	76	1.4
	48"	25' – 11"	577	6.6	6' – 9 3/4"	60	1.3	28' – 10"	637	7.3	7' – 7 1/4"	79	1.5	35' – 4"	791	9.0	9' – 3 3/4"	88	1.8
	54"	28' – 6"	711	7.8	7' – 9"	83	1.6	31' – 9"	781	8.7	8' – 8"	81	1.8	38' – 11"	958	10.7	10' – 7 1/4"	97	2.2
	60"	31' – 1"	805	9.2	8' – 6 1/4"	91	1.9	34' – 8"	881	10.2	9' – 6 1/4"	97	2.1	42' – 5"	1,113	12.5	11' – 8"	124	2.6
	66"	33' – 8"	907	10.6	9' – 0 3/4"	98	2.1	37' – 6"	1,028	11.8	10' – 1 1/4"	102	2.4	46' – 0"	1,235	14.5	12' – 4 1/4"	132	2.9
	72"	36' – 3"	1,071	12.1	9' – 8"	105	2.4	40' – 5"	1,207	13.5	10' – 9 1/4"	110	2.6	49' – 6"	1,446	16.6	13' – 2 1/4"	141	3.2
3:1	12"	13' – 6"	178	1.6	1' – 9 3/4"	15	0.2	15' – 0"	189	1.8	2' – 0"	15	0.2	18' – 5"	237	2.2	2' – 5 3/4"	17	0.2
	15"	15' – 3"	212	1.9	2' – 3"	17	0.2	17' – 0"	223	2.1	2' – 6"	17	0.3	20' – 10"	276	2.6	3' – 0 3/4"	20	0.3
	18"	17' – 1"	231	2.3	2' – 9"	19	0.3	19' – 1"	259	2.5	3' – 1"	29	0.3	23' – 4"	318	3.1	3' – 9 1/4"	32	0.4
	21"	18' – 11"	306	2.7	3' – 2 1/4"	31	0.4	21' – 1"	339	3.0	3' – 6 3/4"	33	0.4	25' – 10"	413	3.7	4' – 4 1/4"	36	0.5
	24"	20' – 8"	345	3.1	3' – 8 3/4"	35	0.4	23' – 1"	384	3.5	4' – 1 3/4"	36	0.5	28' – 3"	462	4.2	5' – 0 3/4"	40	0.6
	27"	22' – 6"	376	3.7	4' – 0 3/4"	38	0.5	25' – 1"	438	4.1	4' – 6 1/4"	39	0.6	30' – 9"	522	5.0	5' – 6 1/4"	44	0.7
	30"	24' – 4"	422	4.1	4' – 5 3/4"	40	0.6	27' – 2"	466	4.6	5' – 0"	42	0.6	33' – 3"	578	5.6	6' – 1 3/4"	47	0.8
	33"	26' – 2"	476	4.8	4' – 10"	43	0.6	29' – 2"	522	5.3	5' – 4 3/4"	46	0.7	35' – 9"	644	6.5	6' – 7 1/4"	51	0.9
	36"	27' – 11"	590	5.9	5' – 3"	47	0.8	31' – 2"	645	6.6	5' – 10 3/4"	50	0.9	38' – 2"	787	8.0	7' – 2 1/4"	56	1.2
	42"	31' – 7"	684	7.3	6' – 0 1/4"	53	1.1	35' – 3"	776	8.2	6' – 8 3/4"	56	1.2	43' – 2"	933	10.0	8' – 3"	79	1.4
	48"	36' – 9"	880	9.6	6' – 9 3/4"	61	1.3	41' – 0"	953	10.7	7' – 7 1/4"	81	1.5	50' – 2"	1,166	13.1	9' – 3 3/4"	88	1.8
	54"	40' – 5"	1,065	11.4	7' – 9"	85	1.6	45' – 0"	1,185	12.7	8' – 8"	89	1.8	55' – 2"	1,435	15.5	10' – 7 1/4"	97	2.2
	60"	44' – 0"	1,224	13.3	8' – 6 1/4"	93	1.9	49' – 1"	1,356	14.8	9' – 6 1/4"	96	2.1	60' – 1"	1,635	18.2	11' – 8"	124	2.6
	66"	47' – 7"	1,357	15.4	9' – 1"	98	2.1	53' – 1"	1,497	17.2	10' – 1 1/4"	103	2.3	65' – 1"	1,892	21.1	12' – 4 1/4"	130	2.9
	72"	51' – 3"	1,624	17.7	9' – 8"	105	2.3	57' – 2"	1,787	19.7	10' – 9 1/4"	109	2.6	70' – 0"	2,218	24.1	13' – 2 1/4"	139	3.2
4:1	12"	17' – 7"	232	2.1	1' – 9 3/4"	15	0.2	19' – 8"	259	2.4	2' – 0"	16	0.2	24' – 0"	314	2.9	2' – 5 3/4"	18	0.2
	15"	19' – 11"	272	2.5	2' – 3"	17	0.2	22' – 3"	301	2.8	2' – 6"	18	0.3	27' – 3"	361	3.5	3' – 0 3/4"	21	0.3
	18"	22' – 3"	313	3.0	2' – 9"	19	0.3	24' – 10"	344	3.3	3' – 1"	29	0.3	30' – 5"	427	4.0	3' – 9 1/4"	32	0.4
	21"	24' – 7"	407	3.6	3' – 2 1/4"	31	0.4	27' – 5"	446	4.0	3' – 6 3/4"	33	0.4	33' – 7"	549	4.9	4' – 4 1/4"	36	0.5
	24"	26' – 11"	455	4.1	3' – 8 3/4"	35	0.4	30' – 0"	499	4.5	4' – 1 3/4"	36	0.5	36' – 9"	609	5.6	5' – 0 3/4"	40	0.6
	27"	29' – 3"	514	4.8	4' – 0 3/4"	38	0.5	32' – 7"	562	5.4	4' – 6 1/4"	40	0.6	39' – 11"	703	6.6	5' – 6 1/4"	43	0.7
	30"	31' – 7"	568	5.4	4' – 5 3/4"	40	0.6	35' – 3"	620	6.0	5' – 0"	42	0.6	43' – 2"	768	7.4	6' – 1 3/4"	49	0.8
	33"	33' – 11"	634	6.2	4' – 10"	43	0.7	37' – 10"	710	7.0	5' – 4 3/4"	46	0.7	46' – 4"	848	8.5	6' – 7 1/4"	52	0.9
	36"	36' – 3"	776	7.7	5' – 3"	48	0.9	40' – 5"	868	8.6	5' – 10 3/4"	49	0.9	49' – 6"	1,058	10.6	7' – 2 1/4"	56	1.1
	42"	40' – 11"	921	9.6	6' – 0 1/4"	53	1.0	45' – 7"	1,022	10.7	6' – 8 3/4"	57	1.2	55' – 10"	1,262	13.1	8' – 3"	78	1.4
	48"	47' – 7"	1,152	12.6	6' – 10"	61	1.3	53' – 1"	1,268	14.0	7' – 7 1/4"	80	1.5	65' – 1"	1,587	17.2	9' – 3 3/4"	86	1.8
	54"	52' – 3"	1,416	14.9	7' – 9 1/4"	86	1.6	58' – 4"	1,589	16.6	8' – 8"	89	1.8	71' – 5"	1,924	20.4	10' – 7 1/4"	95	2.2
	60"	56' – 11"	1,606	17.5	8' – 6 3/4"	92	1.9	63' – 6"	1,806	19.5	9' – 6 1/4"	95	2.1	77' – 9"	2,192	23.9	11' – 8"	122	2.6
	66"	61' – 7"	1,819	20.2	9' – 0 3/4"	97	2.1	68' – 8"	2,019	22.5	10' – 1 1/4"	101	2.4	84' – 2"	2,472	27.6	12' – 4 1/4"	131	2.9
	72"	66' – 3"	2,150	23.2	9' – 8"	104	2.4	73' – 11"	2,379	25.9	10' – 9 1/4"	108	2.6	90' – 6"	2,937	31.7	13' – 2 1/4"	138	3.2
6:1	12"	25' – 11"	342	3.1	1' – 9 3/4"	15	0.2	28' – 10"	374	3.5	2' – 0"	16	0.2	35' – 4"	456	4.3	2' – 5 3/4"	17	0.2
	15"	29' – 3"	390	3.7	2' – 3"	17	0.2	32' – 7"	442	4.2	2' – 6"	18	0.2	39' – 11"	549	5.1	3' – 0 3/4"	20	0.3
	18"	32' – 7"	459	4.4	2' – 9"	20	0.3	36' – 4"	515	4.9	3' – 1"	29	0.3	44' – 7"	629	6.0	3' – 9 1/4"	33	0.4
	21"	36' – 0"	608	5.3	3' – 2 1/4"	31	0.4	40' – 2"	660	5.9	3' – 6 3/4"	33	0.4	49' – 2"	823	7.2	4' – 4 1/4"	38	0.5
	24"	39' – 4"	672	6.0	3' – 8 3/4"	35	0.4	43' – 11"	748	6.7	4' – 1 3/4"	36	0.5	53' – 9"	920	8.2	5' – 0 3/4"	42	0.6
	27"	42' – 8"	770	7.1	4' – 0 3/4"	38	0.5	47' – 8"	852	8.0	4' – 6 1/4"	41	0.5	58' – 4"	1,039	9.7	5' – 6 1/4"	45	0.7
	30"	46' – 1"	839	8.0	4' – 5 3/4"	40	0.6	51' – 5"	949	8.9	5' – 0"	44	0.6	62' – 11"	1,162	10.9	6' – 1 3/4"	48	0.8
	33"	49' – 5"	947	9.2	4' – 10"	45	0.7	55' – 2"	1,040	10.3	5' – 4 3/4"	48	0.7	67' – 6"	1,292	12.6	6' – 7 1/4"	50	0.9
	36"	52' – 10"	1,151	11.4	5' – 3"	49	0.8	58' – 11"	1,287	12.7	5' – 10 3/4"	51	1.0	72' – 1"	1,583	15.6	7' – 2 1/4"	55	1.1
	42"	59' – 6"	1,365	14.2	6' – 0 1/4"	55	1.0	66' – 5"	1,530	15.8	6' – 8 3/4"	57	1.2	81' – 4"	1,875	19.4	8' – 3"	76	1.4
	48"	69' – 4"	1,737	18.5	6' – 10"	59	1.3	77' – 4"	1,942	20.7	7' – 7 1/4"	79	1.5	94' – 9"	2,368	25.3	9' – 3 3/4"	86	1.8
	54"	76' – 1"	2,138	22.0	7' – 9 1/4"	83	1.6	84' – 10"	2,378	24.6	8' – 8"	87	1.8	103' – 11"	2,912	30.1	10' – 7 1/4"	95	2.2
	60"	82' – 10"	2,426	25.8	8' – 6 3/4"	90	1.9	92' – 5"	2,681	28.8	9' – 6 1/4"	94	2.1	113' – 2"	3,294	35.3	11' – 8"	122	2.6
	66"	89' – 7"	2,730	29.9	9' – 0 3/4"	96	2.1	99' – 11"	3,038	33.3	10' – 1 1/4"	101	2.4	122' – 4"	3,697	40.8	12' – 4 1/4"	130	2.9
	72"	96' – 3"	3,218	34.2	9' – 8"	102	2.4	107' – 5"	3,580	38.2	10' – 9 1/4"	108	2.6	131' – 6"	4,372	46.8	13' – 2 1/4"	139	3.2

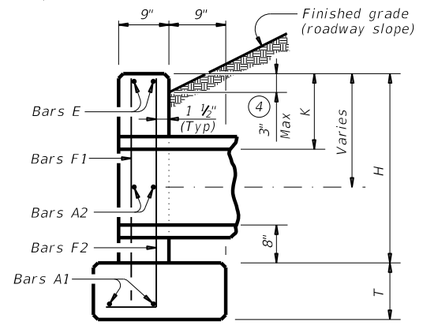


ELEVATION

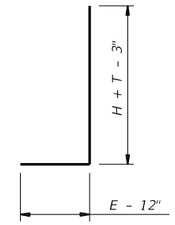


PLAN OF SKEWED PIPES

Showing 30° skew.



SECTION AT CENTER OF PIPE



BARS F2

(1) Total quantites include one 3'–1" lap for bars over 60' in length.

(2) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(3) Indicated slope is perpendicular to centerline pipe or pipes.

(4) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) Dimensions shown are usual and maximum.

(6) Quantities shown are for one structure end only (one headwall).

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' – 9"	1' – 0"	2' – 8"	0' – 9"	1' – 9"
15"	0' – 11"	1' – 0"	2' – 11"	0' – 9"	1' – 9"
18"	1' – 2"	1' – 0"	3' – 2"	0' – 9"	1' – 9"
21"	1' – 4"	1' – 0"	3' – 5"	0' – 9"	2' – 0"
24"	1' – 7"	1' – 0"	3' – 8"	0' – 9"	2' – 0"
27"	1' – 8"	1' – 0"	3' – 11"	0' – 9"	2' – 3"
30"	1' – 10"	1' – 0"	4' – 2"	0' – 9"	2' – 3"
33"	1' – 11"	1' – 0"	4' – 5"	0' – 9"	2' – 6"
36"	2' – 1"	1' – 0"	4' – 8"	1' – 0"	2' – 6"
42"	2' – 4"	1' – 0"	5' – 2"	1' – 0"	2' – 9"
48"	2' – 7"	1' – 3"	5' – 11"	1' – 0"	3' – 0"
54"	3' – 0"	1' – 3"	6' – 5"	1' – 0"	3' – 3"
60"	3' – 3"	1' – 3"	6' – 11"	1' – 0"	3' – 6"
66"	3' – 3"	1' – 3"	7' – 5"	1' – 0"	3' – 9"
72"	3' – 4"	1' – 3"	7' – 11"	1' – 0"	4' – 0"

TABLE OF (6) REINFORCING STEEL

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' – 6"	~
E	#5	~	2
F	#5	1' – 0"	~

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.

Texas Department of Transportation

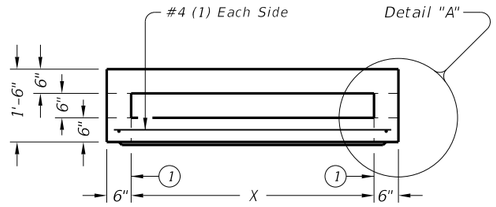
Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR SKEWED PIPE CULVERTS

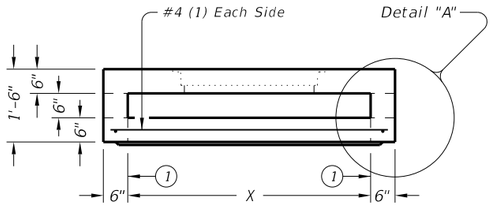
CH-PW-S

FILE: chpwsste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		75

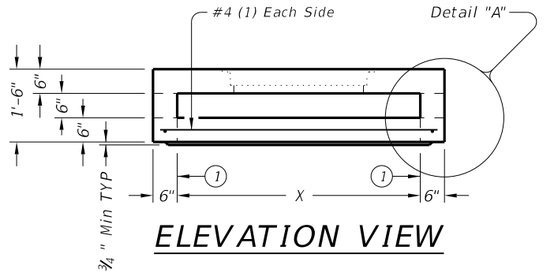
DATE: $DATE$ $TIME$
FILE: $FILE$



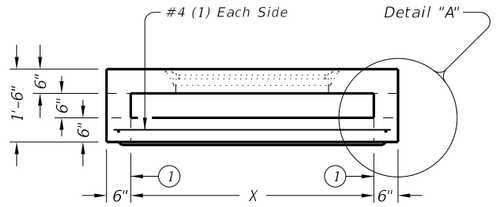
ELEVATION VIEW



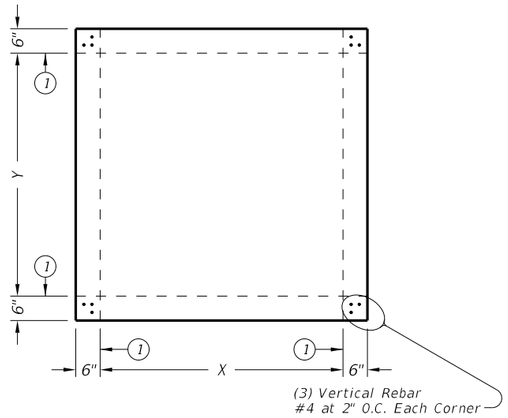
ELEVATION VIEW



ELEVATION VIEW

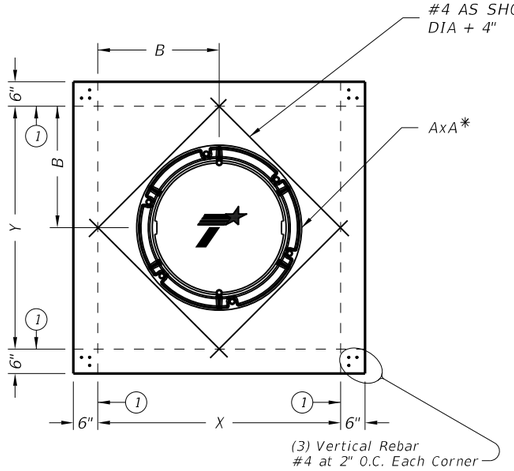


ELEVATION VIEW



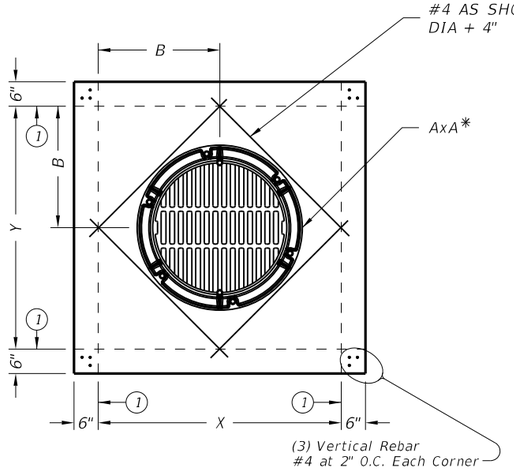
PLAN VIEW
NO OPENINGS

STYLE 'SL'



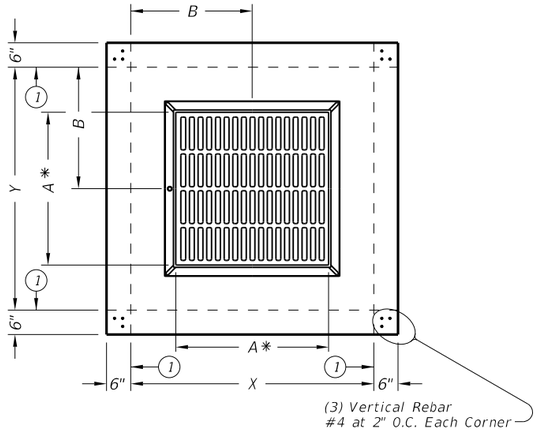
PLAN VIEW
32" DIA CAST-IN RING & COVER

STYLE 'RC'



PLAN VIEW
32" DIA CAST-IN RING & GRATE

STYLE 'RG'



PLAN VIEW
CAST-IN FRAME & GRATE

STYLE 'FG'

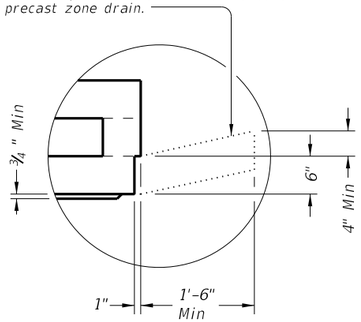
(1) Matches inside face of wall of precast base or riser below inlet.

FABRICATION NOTES:
1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide clear cover of ¾" to reinforcing from bottom of slab for structural reinforcement. Place short span reinforcing closest to surface.
4. No substitution is allowed for diagonal #4 bars around openings.
5. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
6. Provide lifting devices in conformance with Manufacturer's recommendations.

INSTALLATION NOTES:
1. PAZD is for use in ditches and medians outside of the horizontal clearance (clear zone). Precast Area Zone Drain is not intended for direct traffic and may not be placed in roadway.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.

GENERAL NOTES:
1. Designed according to ASTM C913.
2. Payment for inlet is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, style, size, and opening size (when applicable).

Construct cast-in-place reinforced concrete apron when shown elsewhere in plans. Use Class "A" concrete. Apron is subsidiary to PAZD. Apron is 1'-6" Min width around precast zone drain.



DETAIL "A"
(Reinforcing not shown for clarity)
When an apron is to be cast around PAZD, use detail above to create an apron ledge on all 4 sides.

Style	Size (X x Y)	A x A*	B x B	Short Span Reinf Steel Area	Long Span Reinf Steel Area
SL	3'x3'	n/a	n/a	0.37 in²/ft	0.37 in²/ft
RC,RG	3'x3'	32" Dia	1.5'x1.5'	0.37 in²/ft	0.37 in²/ft
FG	3'x3'	3'x3'	1.5'x1.5'	0.37 in²/ft	0.37 in²/ft
SL	4'x4'	n/a	n/a	0.34 in²/ft	0.34 in²/ft
RC,RG	4'x4'	32" Dia	2'x2'	0.34 in²/ft	0.34 in²/ft
FG	4'x4'	3'x3'	2'x2'	0.34 in²/ft	0.34 in²/ft
FG	4'x4'	4'x4'	2'x2'	0.34 in²/ft	0.34 in²/ft
SL	5'x5'	n/a	n/a	0.43 in²/ft	0.43 in²/ft
RC,RG	5'x5'	32" Dia	2.5'x2.5'	0.68 in²/ft	0.68 in²/ft
FG	5'x5'	3'x3'	2.5'x2.5'	0.43 in²/ft	0.43 in²/ft
FG	5'x5'	4'x4'	2.5'x2.5'	0.43 in²/ft	0.43 in²/ft

* Nominal frame/grate or ring/cover size.

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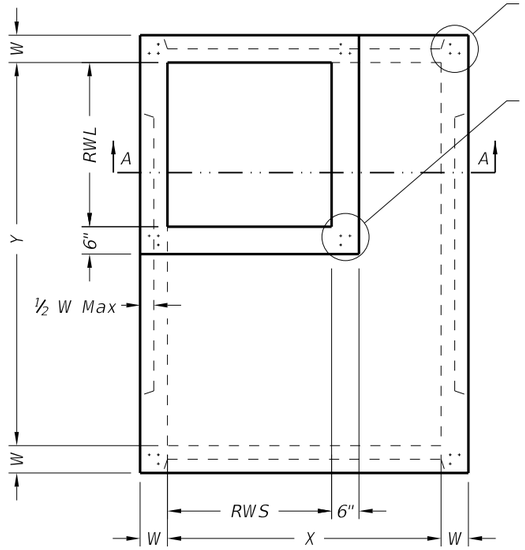
PRECAST AREA ZONE DRAIN

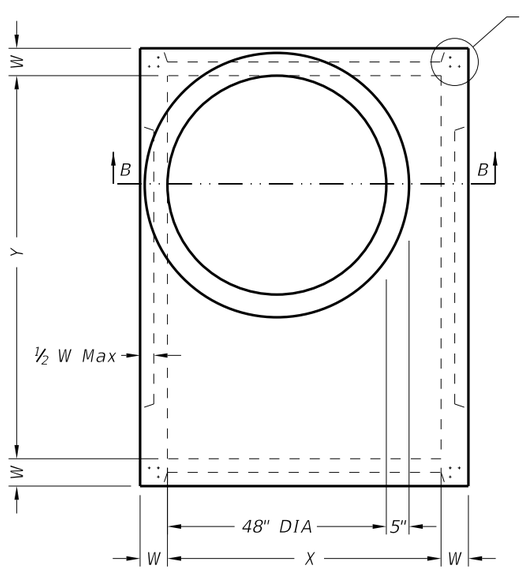
PAZD

FILE: prestd08-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		76



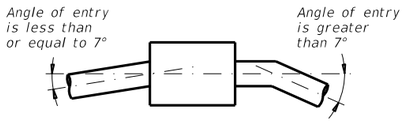
PLAN VIEW "A"

SQUARE REDUCED RISER OPTION



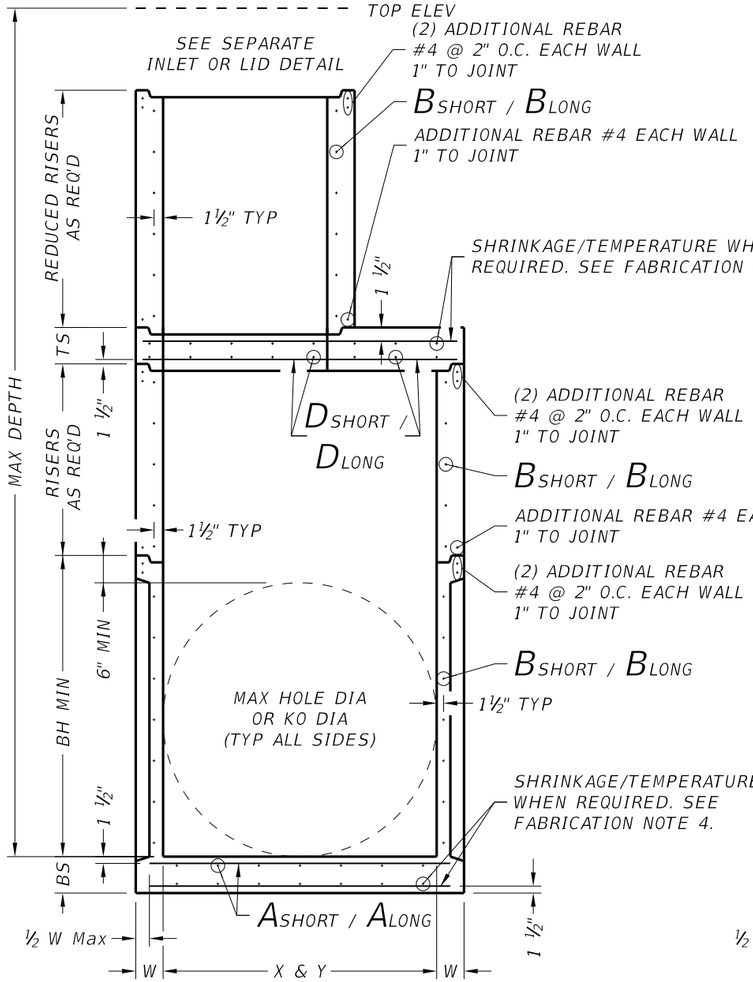
PLAN VIEW "B"

ROUND REDUCED RISER OPTION



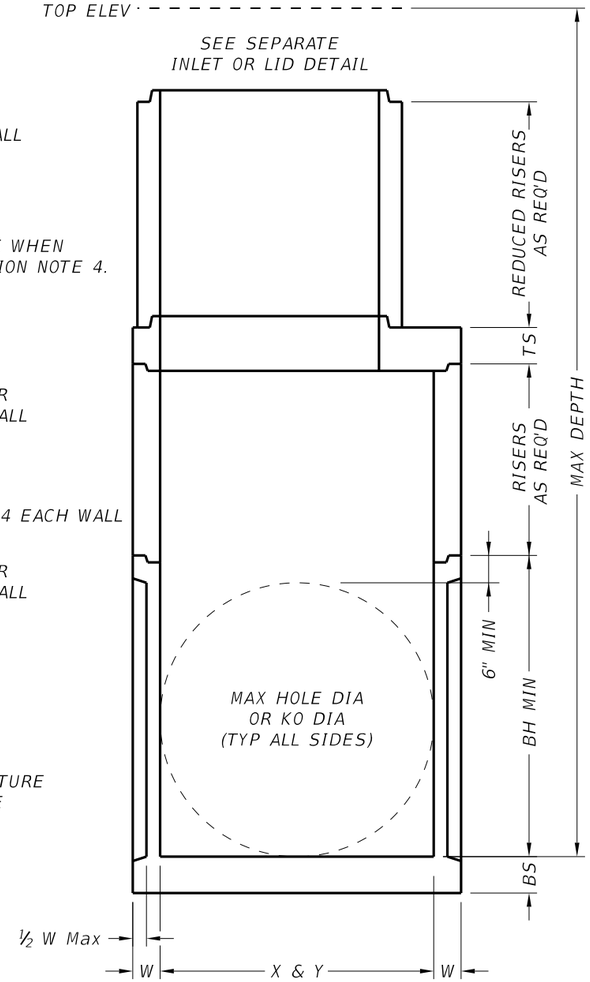
PIPE CONNECTION DETAIL

Connect pipes within 7° of normal to PB wall.
If necessary, use pipe elbow or curved
approach alignment to stay within this limit.



SECTION A-A

SQUARE REDUCED RISER OPTION



SECTION B-B

ROUND REDUCED RISER OPTION

Cover dimensions are clear dimensions, unless noted otherwise.

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 ½" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in²/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.

INSTALLATION NOTES:

1. If required elsewhere. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to specified inlet or manhole.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

GENERAL NOTES:

1. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for precast base is subsidiary to the specified inlet, per Item 465, "Junction Boxes, Manholes, and Inlets."

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRECAST BASE

PB

FILE: prestd01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		77

DATE: $DATE$ $TIME$
FILE: $FILE$

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	Size	MAX DEPTH = 15 ft. to top of BASE SLAB										MAX DEPTH = 25 ft. to top of BASE SLAB										Min Height (See Gen Note 3)	Max HOLE DIA (See Fab Note 2)	Max KO DIA (See Fab Note 2)
		Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)				Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)						
		Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Reduced Riser Size	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Reduced Riser Size	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness			
	X x Y	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	BH MIN	HOLE DIA	KO DIA
	ft.	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	ft. **	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	ft. **	in^2/ft	in^2/ft	in.	ft.	in.	in.
Precast Junction Box (PJB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	0.37	0.37	9	0.29	0.29	6	0.24	0.24	6	N/A	0.37	0.37	9	3.5	36	36
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	0.41	0.41	9	0.47	0.47	6	0.38	0.38	6	N/A	0.41	0.41	9	4.5	48	48
	3x5	0.29	0.18	6	0.19	0.35	6	N/A	0.48	0.48	9	0.39	0.18	6	0.23	0.59	6	N/A	0.48	0.48	9	3.5	36/60	36/60
	4x5	0.36	0.18	6	0.22	0.34	6	N/A	0.42	0.42	9	0.53	0.26	6	0.39	0.59	6	N/A	0.42	0.42	9	4.5	48/60	48/60
	5x5	0.36	0.36	6	0.34	0.34	6	N/A	0.43	0.43	9	0.62	0.62	6	0.59	0.59	6	N/A	0.43	0.43	9	5.5	60	60
	5x6	0.27	0.27	9	0.34	0.45	6	N/A	0.48	0.48	9	0.47	0.45	9	0.38	0.54	8	N/A	0.48	0.48	9	5.5	60/72	60/72
	6x6	0.27	0.27	9	0.45	0.45	6	N/A	0.56	0.56	9	0.52	0.52	9	0.54	0.54	8	N/A	0.56	0.56	9	6.5	72	72
	8x8	0.46	0.46	9	0.51	0.51	8	N/A	0.45	0.45	12	0.87	0.87	9	0.59	0.59	10	N/A	0.45	0.45	12	8.5	96	72
Precast Base (PB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	N/A	N/A	N/A	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	3.5	36	36
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	0.47	0.47	6	0.38	0.38	6	N/A	N/A	N/A	N/A	4.5	48	48
	3x5	0.29	0.18	6	0.19	0.35	6	3x3	0.30	0.34	9	0.39	0.18	6	0.23	0.59	6	3x3	0.40	0.40	9	3.5	36/60	36/60
	4x5	0.36	0.18	6	0.22	0.34	6	3x3	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	3x3	0.46	0.37	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	4x4	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	4x4	0.39	0.39	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	48"	0.39	0.39	9	0.53	0.26	6	0.39	0.59	6	48"	0.47	0.47	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	3x5	0.33	0.40	9	0.53	0.26	6	0.39	0.59	6	3x5	0.48	0.48	9	4.5	48/60	48/60
	5x5	0.36	0.36	6	0.34	0.34	6	3x3	0.34	0.34	9	0.62	0.62	6	0.59	0.59	6	3x3	0.53	0.53	9	5.5	60	60
	5x5	0.36	0.36	6	0.34	0.34	6	4x4	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	4x4	0.64	0.64	9	5.5	60	60
	5x5	0.38	0.38	6	0.34	0.34	6	48"	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	48"	0.64	0.64	9	5.5	60	60
	5x5	0.36	0.36	6	0.34	0.34	6	3x5	0.34	0.40	9	0.62	0.62	6	0.59	0.59	6	3x5	0.53	0.53	9	5.5	60	60
	5x6	0.31	0.31	9	0.34	0.45	6	3x3	0.34	0.34	9	0.47	0.45	9	0.38	0.54	8	3x3	0.61	0.50	9	5.5	60/72	60/72
	5x6	0.27	0.27	9	0.34	0.45	6	4x4	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	4x4	0.74	0.57	9	5.5	60/72	60/72
	5x6	0.29	0.29	9	0.34	0.45	6	48"	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	48"	0.74	0.57	9	5.5	60/72	60/72
	5x6	0.29	0.29	9	0.34	0.45	6	3x5	0.45	0.45	9	0.47	0.45	9	0.38	0.54	8	3x5	0.61	0.61	9	5.5	60/72	60/72
	6x6	0.29	0.29	9	0.45	0.45	6	3x3	0.41	0.41	9	0.52	0.52	9	0.54	0.54	8	3x3	0.74	0.74	9	6.5	72	72
	6x6	0.27	0.27	9	0.45	0.45	6	4x4	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	4x4	0.87	0.87	9	6.5	72	72
	6x6	0.29	0.29	9	0.45	0.45	6	48"	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	48"	0.87	0.87	9	6.5	72	72
	6x6	0.29	0.29	9	0.45	0.45	6	3x5	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	3x5	0.87	0.87	9	6.5	72	72
	8x8	0.52	0.52	9	0.51	0.51	8	3x3	0.61	0.61	12	0.91	0.91	9	0.70	0.70	10	3x3	0.85	0.85	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	4x4	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	4x4	1.01	1.01	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	48"	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	48"	1.01	1.01	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	3x5	0.70	0.85	12	0.87	0.87	9	0.70	0.70	10	3x5	1.01	1.01	12	8.5	96	72

** Unless otherwise indicated.

FABRICATION NOTES:
1. Maximum spacing of reinforcement is 8".
2. At manufacturer's option, provide cast or cored holes or thin wall panels (KO) to the maximum diameter shown for each. When no penetration is required, it is acceptable to provide a wall with no sectional reduction.

GENERAL NOTES:
1. Precast Junction Box consists of base slab, base unit, risers (as required), and below grade slab. See sheet PJB for details.
2. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PB for details.
3. Min Height shown is for stock base units. Use stock base units whenever practical. Smaller height base units can be used in special installation circumstances, when noted elsewhere in the plans. Absolute minimum height of base units is 2'-6".

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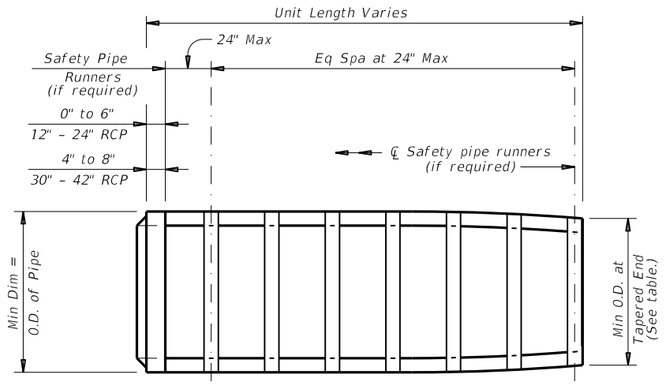
DESIGN DATA FOR PRECAST BASE AND JUNCTION BOX

PDD

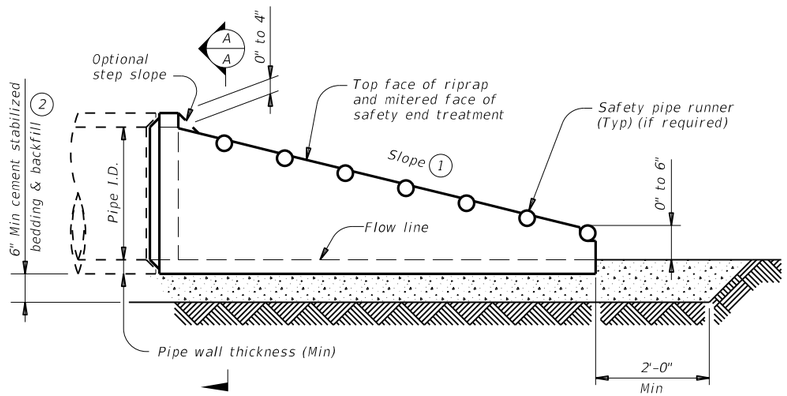
FILE: prestd10-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		78

DATE: $DATE$ $TIME$
FILE: $FILE$



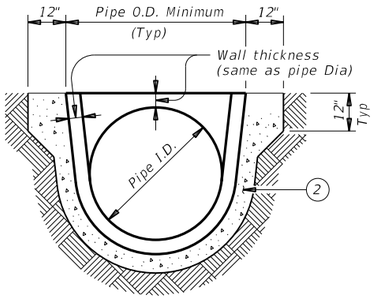
PLAN VIEW – 12" THRU 24"

(Showing spigot end connection.)

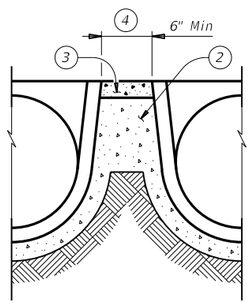


LONGITUDINAL ELEVATION - 12" THRU 24"

(Showing spigot end connection.)



SECTION A-A



MULTIPLE PIPE INSTALLATION

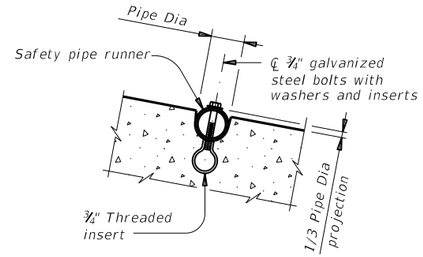
(1) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

(2) Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(3) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

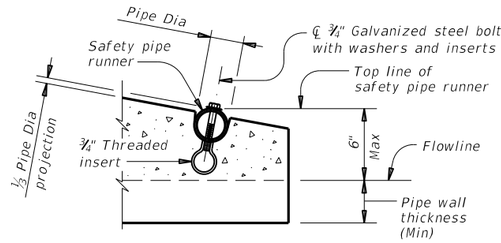
(4) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(5) Safety pipe runners are required for multiple pipe culverts with more than two pipes.

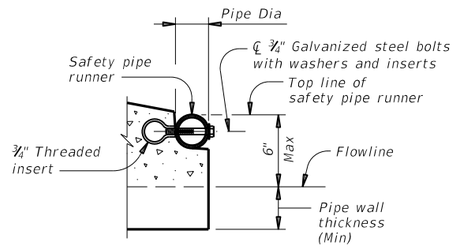


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



OPTION A



OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. per ft. of Pipe)	Max Slope	Min Length of Unit	Pipe Runner Requirements		Required Pipe Runner Sizes		
							Single Pipe	Multiple Pipe	Nominal Dia	O.D.	I.D.
12"	2"	16"	16"	0.07 Circ.	6:1	4'–0"	No	(5)	3" STD	3.500"	3.068"
15"	2 ¼"	19 ½"	19"	0.07 Circ.	6:1	5'–8"	No	(5)	3" STD	3.500"	3.068"
18"	2 ½"	23"	21 ½"	0.07 Circ.	6:1	7'–3"	No	(5)	3" STD	3.500"	3.068"
24"	3"	30"	27"	0.07 Circ.	6:1	10'–6"	No	(5)	3" STD	3.500"	3.068"
30"	3 ½"	37"	31"	0.18 Circ.	6:1	12'–1"	No	Yes	4" STD	4.500"	4.026"
36"	4"	44"	36"	0.19 Ellip.	6:1	15'–4"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	51"	41 ½"	0.23 Ellip.	6:1	18'–7"	Yes	Yes	4" STD	4.500"	4.026"

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Galvanize steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP) may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Manufacture precast concrete end sections in accordance with Item 464, "Reinforced Concrete Pipe" and in accordance with ASTM Specification C–76, Class III, Wall B for circular pipe.

Provide precast concrete end sections with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for grout, mortar, cold applied asphalt joint compound or pre–formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading and installation.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280–2F, "Safety Treatment of Roadside Parallel–Drainage Structures", Texas Transportation Institute, March 1981.

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PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-RP

FILE: psetrpss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		79

DATE: $DATE$ $TIME$
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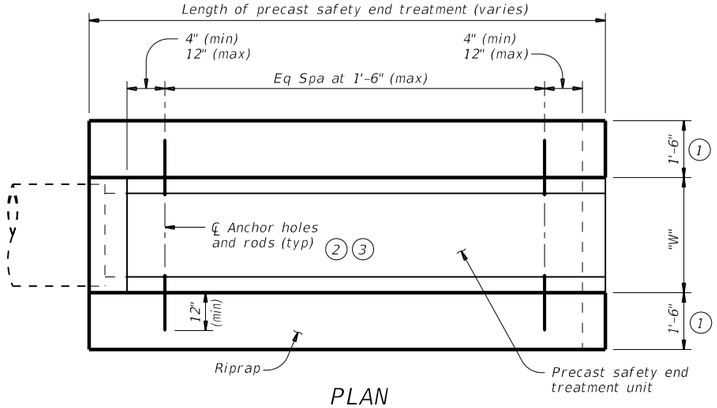
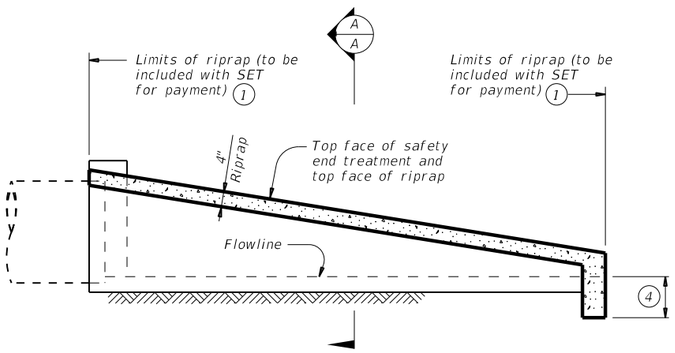
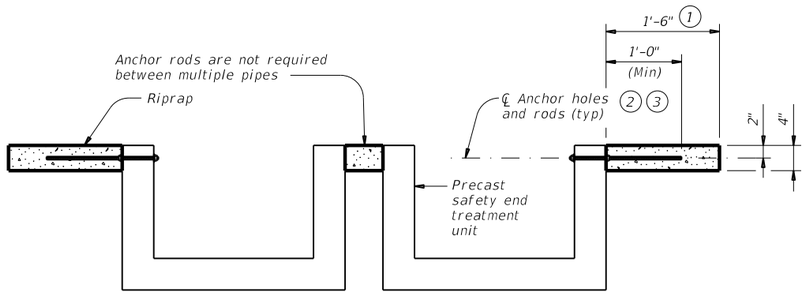


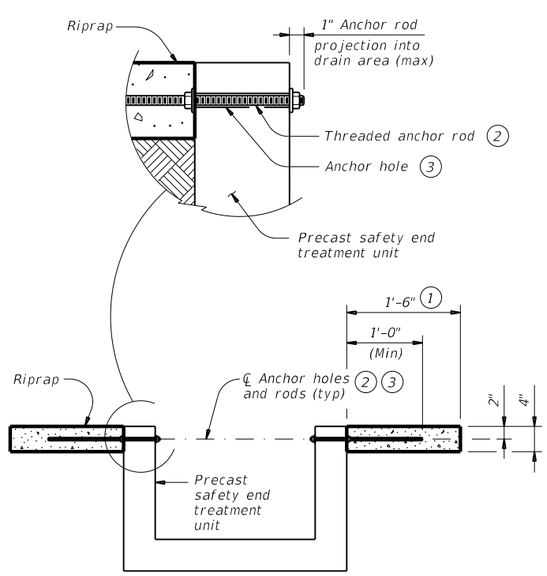
PLAN



LONGITUDINAL ELEVATION



MULTIPLE PIPE INSTALLATION



SINGLE PIPE INSTALLATION

SECTION A-A

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) 5

Nominal Culvert (Pipe) I.D.	PSET-SC and PSET-SP Standards				PSET-RC and PSET-RP Standards			
	Unit Width "W"	Side Slope			Unit Width "W"	Side Slope		
		3:1	4:1	6:1		3:1	4:1	6:1
12"	23.0"	0.1	0.2	0.2	16.0"	0.1	0.1	0.2
15"	26.5"	0.2	0.2	0.3	19.5"	0.1	0.2	0.2
18"	30.0"	0.2	0.2	0.3	23.0"	0.2	0.2	0.3
24"	37.0"	0.3	0.3	0.5	30.0"	0.2	0.3	0.4
30"	44.5"	0.3	0.4	0.6	37.0"	0.3	0.3	0.5
36"	51.5"	0.4	0.5	0.7	44.0"	0.3	0.4	0.6
42"	58.5"	0.5	0.6	0.8	51.0"	0.4	0.5	0.7

(1) Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap". When riprap is cast integrally with the precast safety end treatment, this dimension is 1'-0" minimum.

(2) 1#2" Dia ASTM A307 Gr A threaded anchor rod with 2 nuts and 2 washers. Galvanize all components in accordance with Item 445, "Galvanizing". Repair galvanizing that is damaged during transport or construction in accordance with the specifications.

(3) 3#4" through holes in walls of safety end treatment for riprap anchor rods may be drilled with rotary (coring or masonry) type drilling equipment or may be formed. Do not use percussive (star) type drilling equipment. If holes are drilled, patch spalls in the inside face of the wall exceeding 1#2" from the holes.

(4) Provide riprap toe wall when dimension is shown elsewhere in the plans or when field conditions require a toe wall.

(5) Quantities shown are for one end of one reinforced concrete pipe culvert. For multiple pipe culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only. Quantities are based on the minimum unit lengths shown on the Precast Saftey End Treatment (SET) standard sheets.

MATERIAL NOTES:

Provide Class "B" riprap in accordance with Item 432, "Riprap".

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. The anchor rods shown are always required.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".

Refer to PSET-SC or PSET-SP standard sheets for details of square safety end treatments not shown. Refer to PSET-RC or PSET-RP standard sheets for details of round safety end treatments not shown.

For precast units with integrally cast riprap, substitute reinforcing steel in the amount on 0.26 in./ft. minimum for the threaded anchor rods shown. When requested, submit sealed engineering drawings for approval prior to construction. Shop drawings will not be required. Note that a proprietary precast unit with integral riprap is available from L&R Precast Concrete Works, Inc. (956) 583-6293 or www.lrprecast.com.

Payment for riprap and toewalls is included in the price bid for each safety end treatment.

These riprap details are only applicable when notes that require placement of riprap with precast safety end treatments are shown elsewhere in the plans.

Precast units with integrally cast riprap are permitted unless noted otherwise on the plans.

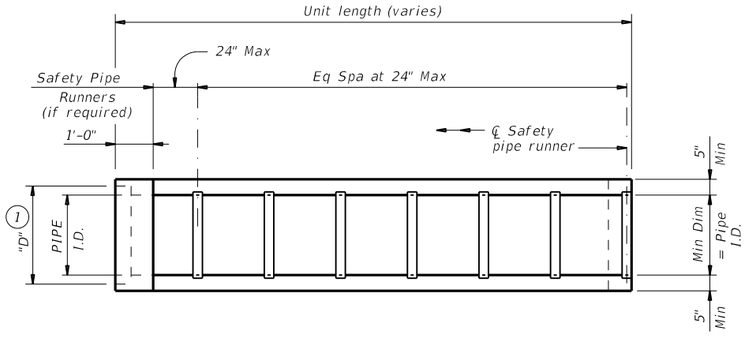
Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT
TYPE II
RIPRAP DETAILS

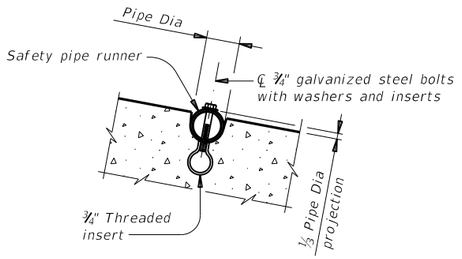
PSET-RR

FILE: psetrrse-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		80



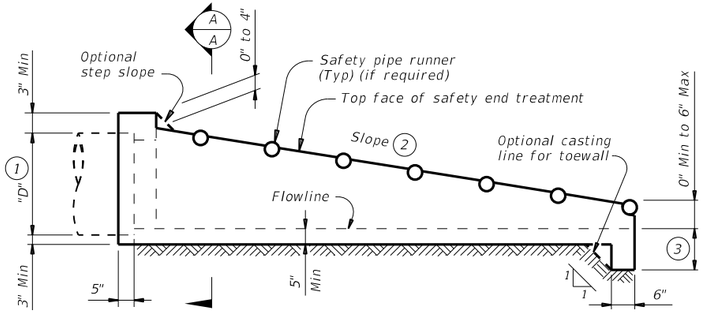
PLAN

(Showing bell end connection.)



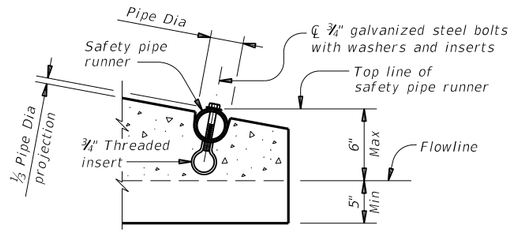
INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

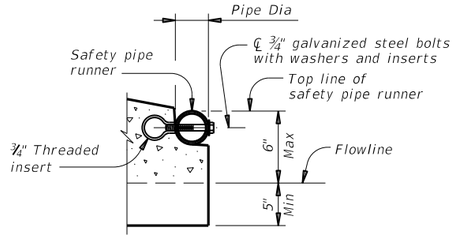


LONGITUDINAL ELEVATION

(Showing bell end connection.)



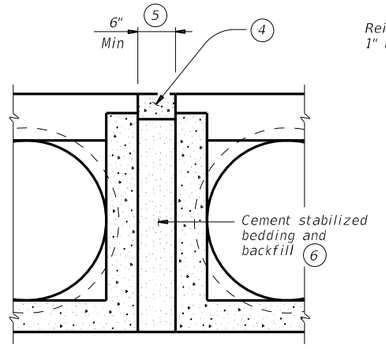
OPTION A



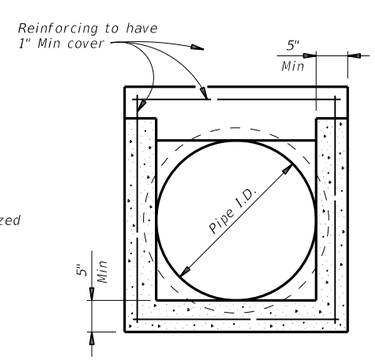
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

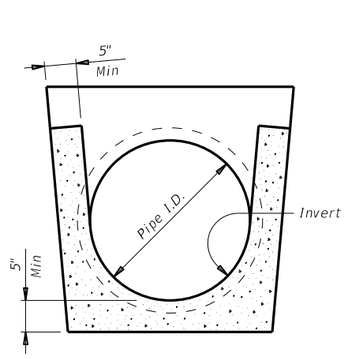
(If required)



MULTIPLE PIPE INSTALLATION

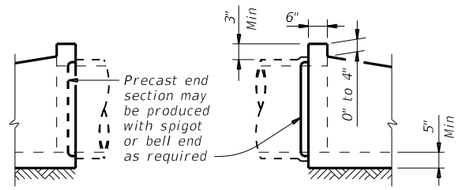


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment.)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (7)	"D" (1)	Slope	Min Length	Pipe Runners Required		Required Pipe Runner Size		
						Single Pipe	Multiple Pipe	Nominal Dia.	O.D.	I.D.
12"	2"	1.15"	17.00"	6:1	4' – 9"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
15"	2 ¼"	1.30"	20.50"	6:1	6' – 5"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
18"	2 ½"	1.60"	24.00"	6:1	8' – 0"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
24"	3"	1.95"	31.00"	6:1	11' – 3"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
30"	3 ½"	2.65"	38.50"	6:1	14' – 8"	No	Yes	4" STD	4.500"	4.026"
36"	4"	2.75"	45.50"	6:1	17' – 11"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	2.7"	52.50"	6:1	21' – 2"	Yes	Yes	4" STD	4.500"	4.026"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(7) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" – D12 x D12 or 5"x5" – D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor the next larger size of safety end treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464, "Reinforced Concrete Pipe". Connect TP by grouting. See Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-SP

FILE: psetspss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	3427	03	007	FM 3356
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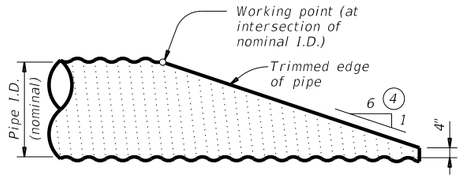
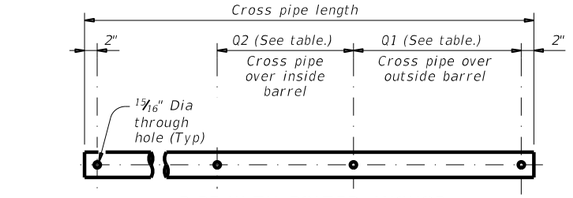


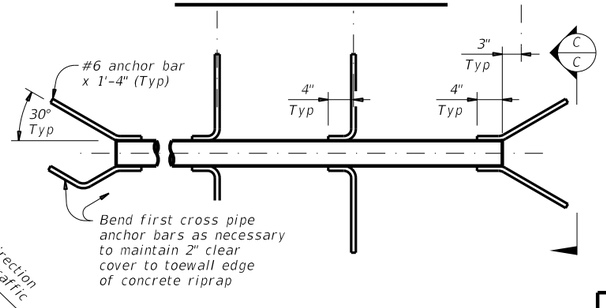
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

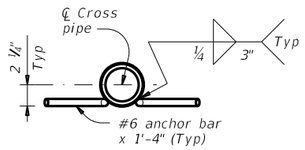
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



PIPE WITH BOLTED ANCHOR

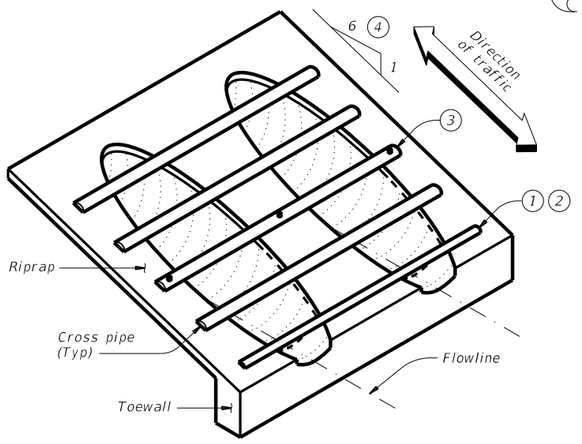


PIPE WITH ANCHOR BARS

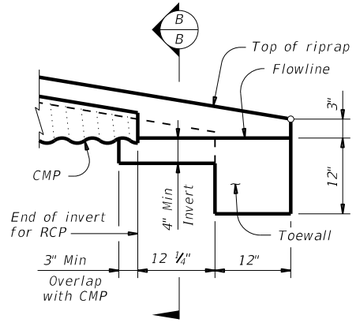


SECTION C-C

CROSS PIPE DETAILS

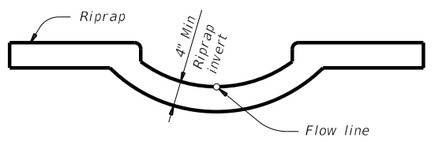


ISOMETRIC VIEW OF TYPICAL INSTALLATION



DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)



SECTION B-B

(Cross pipes not shown for clarity.)

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES (2)

Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' - 9"	N/A	2' - 1"	1' - 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' - 11"	N/A	2' - 5"	2' - 2"		
18"	0.8	1' - 2"	N/A	2' - 10"	2' - 8"		
21"	0.9	1' - 4"	N/A	3' - 2"	3' - 1"		
24"	0.9	1' - 7"	N/A	3' - 6"	3' - 7"		
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"	3 or more pipe culverts	3 1/2" Std (4.000" O.D.)
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

(1) The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

(2) Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.

(3) Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.

(4) Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

(5) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(6) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for contractor's information only.

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

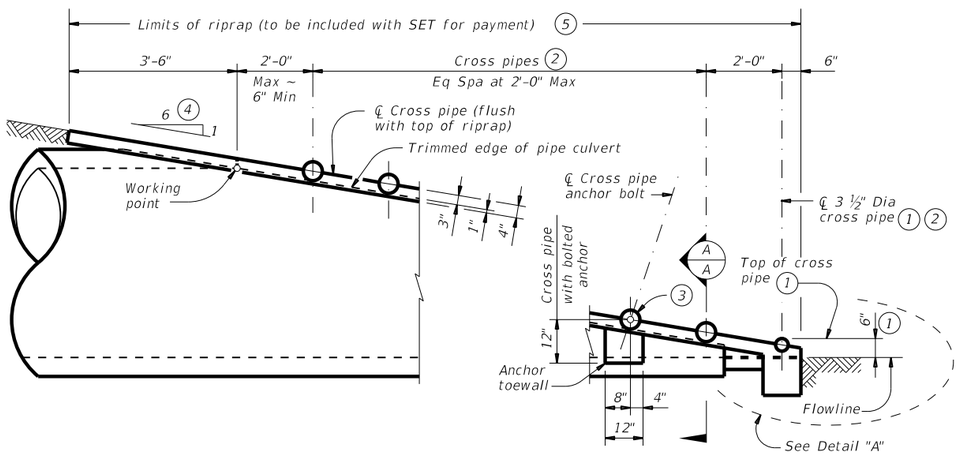
GENERAL NOTES:

Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes.

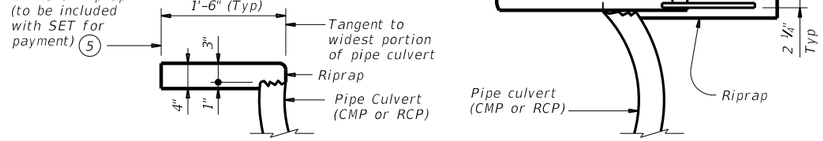
Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.



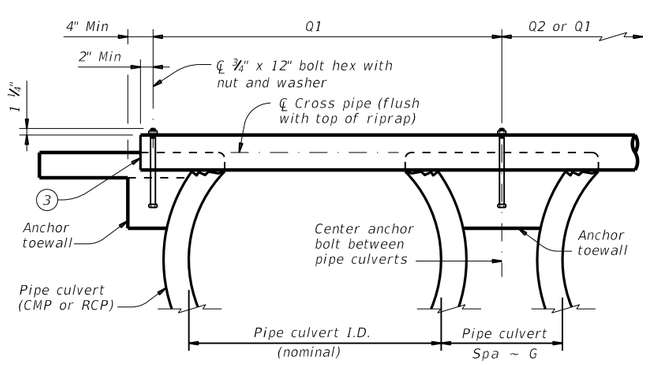
SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



SHOWING CROSS PIPE WITH ANCHOR BAR

SHOWING TYPICAL PIPE CULVERT AND RIPRAP



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 72" DIA PIPE CULVERTS TYPE II ~ PARALLEL DRAINAGE

SETP-PD

FILE: setppdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COUNTY		82

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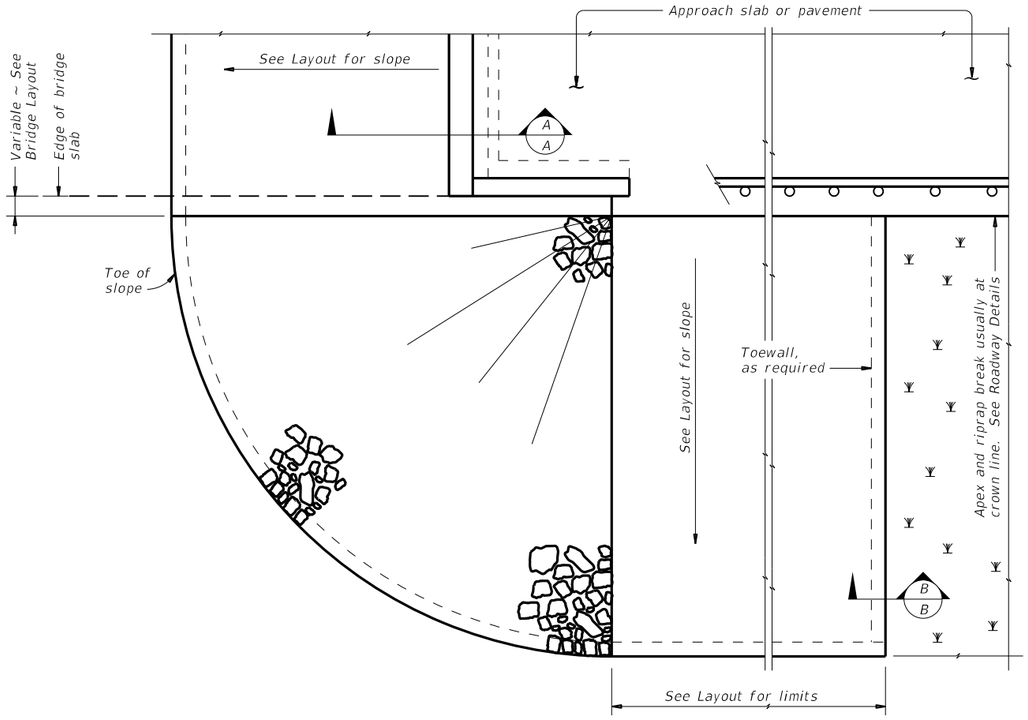
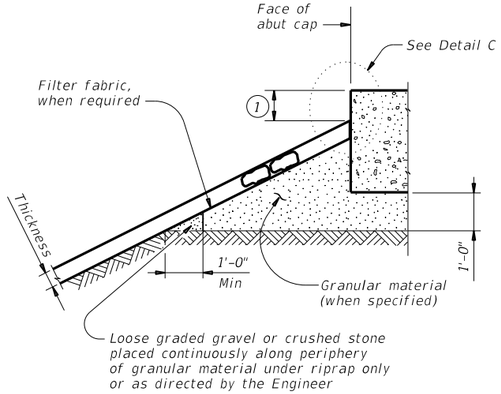
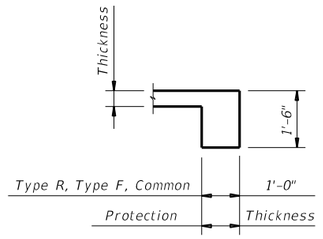


PLAN

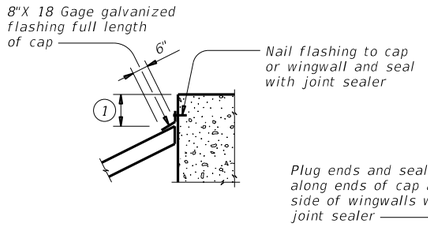


SECTION A-A AT CAP

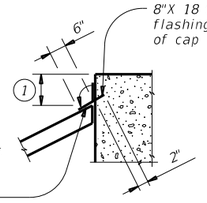


SECTION B-B

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".

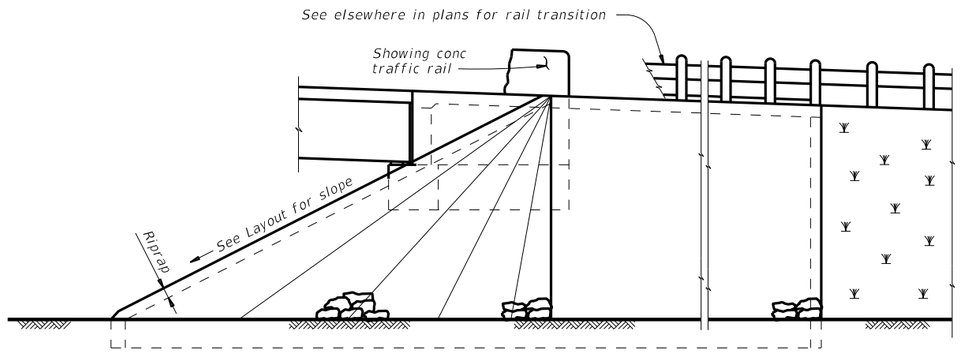


CAP OPTION A



CAP OPTION B

DETAIL C



ELEVATION

(1) Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

GENERAL NOTES:
Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.
See elsewhere in plans for locations and details of shoulder drains.

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES		
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY		
REVISIONS	3427	03	007	FM 3356		
	DIST	COUNTY		SHEET NO.		
	DAL	COLLIN		83		

DATE: $DATE$ $TIME$
FILE: $FILE$

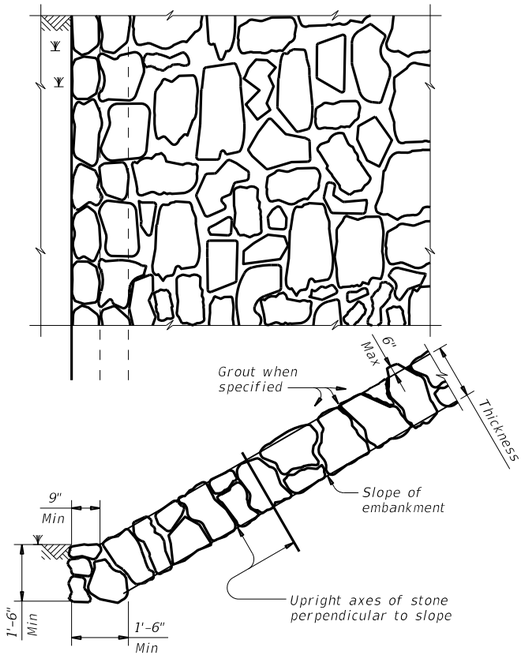


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

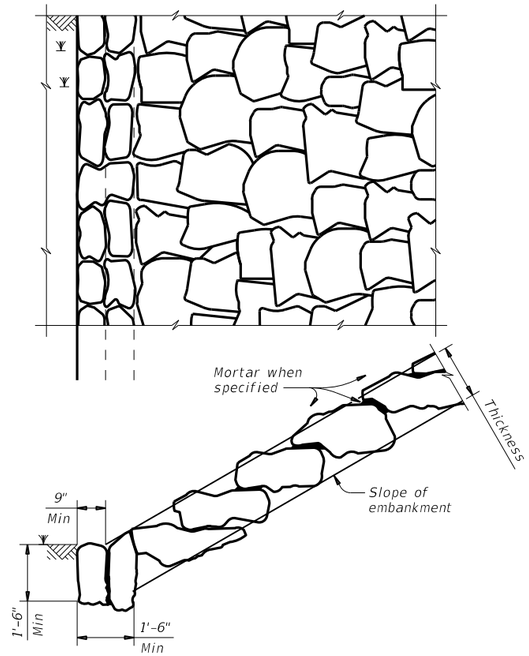


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

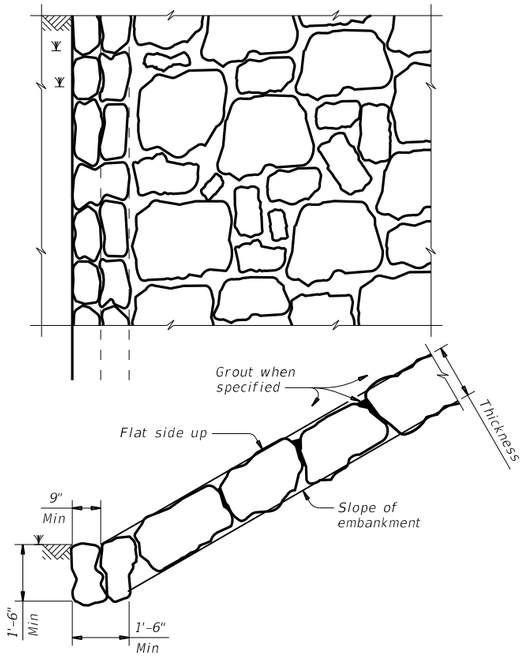


FIGURE 3 ~ TYPE F STONE RIPRAP

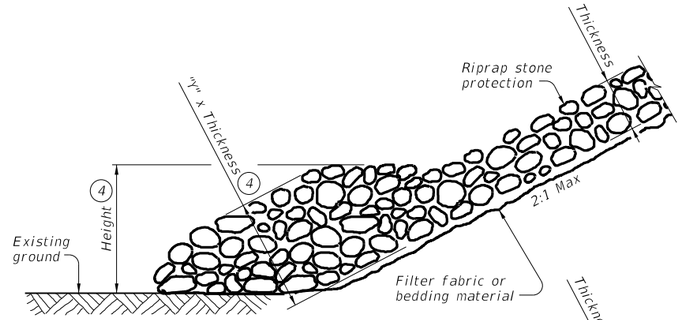
grouted

(2) Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

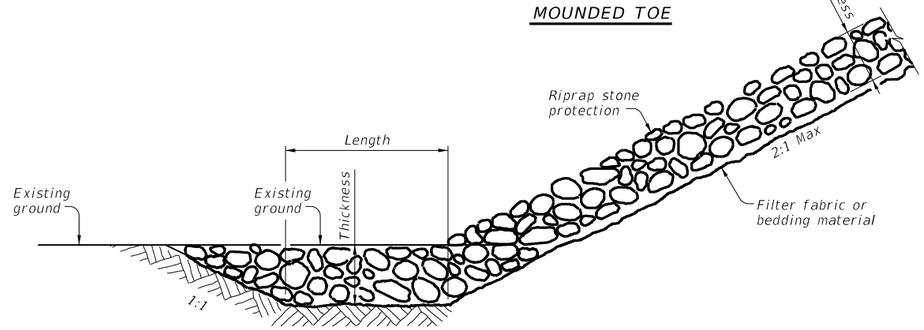
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(4) "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.

(5) List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS (5)

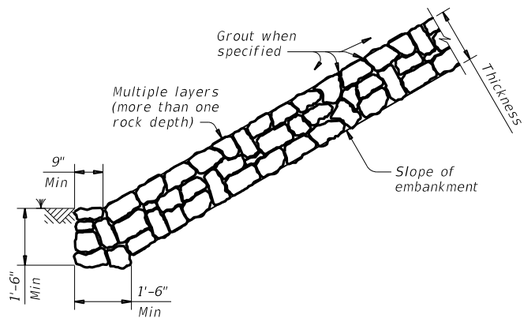


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

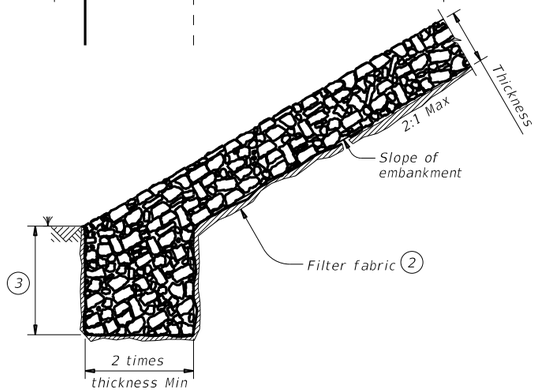


FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		84

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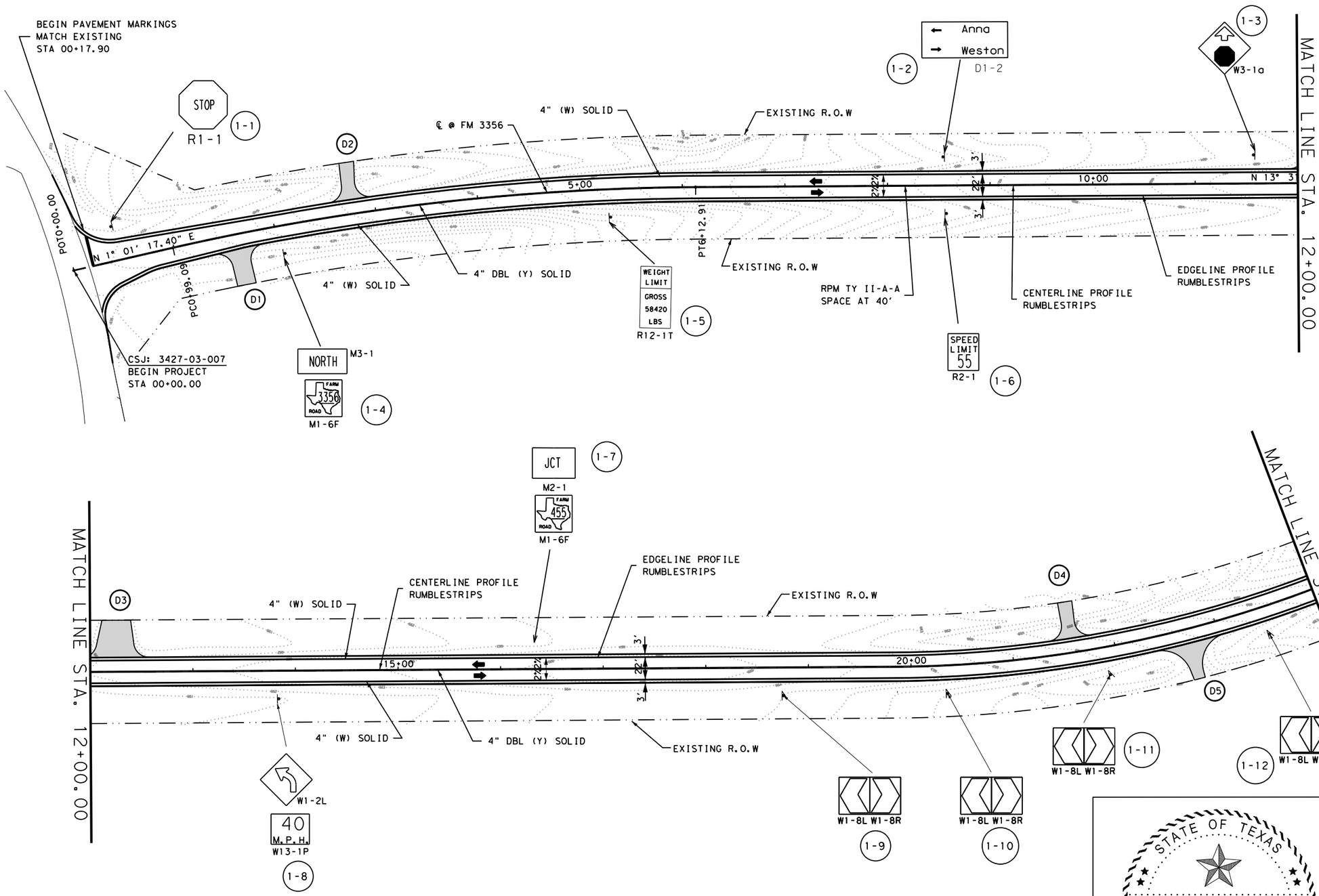
DATE: $DATE$ $TIME$
FILE: $FILE$



NOTES:
** SALVAGE SIGNS AND REINSTALL ON NEW POST.

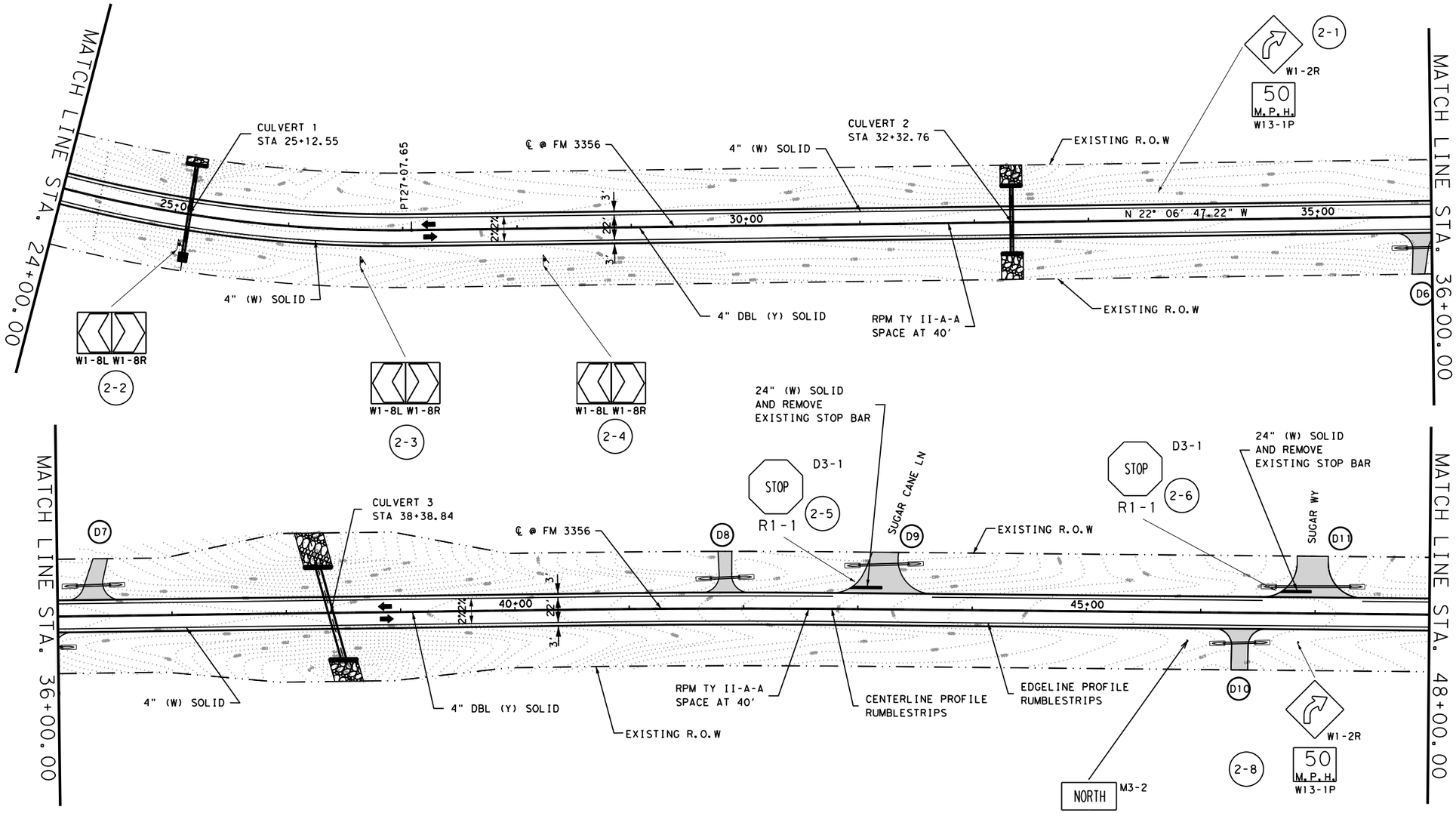
STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

FM 3356
SIGN & PAVEMENT MARKING LAYOUT
STA 0+00 TO 24+00

SHEET 1 OF 7

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS: CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK: MS	TEXAS	DALLAS	COLLIN	
CHECK: JRV	CONTROL	SECTION	JOB	85
	3427	03	007	



NOTES:
** SALVAGE SIGNS AND REINSTALL ON NEW POST.

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
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LICENSED
PROFESSIONAL ENGINEER
02/03/2023

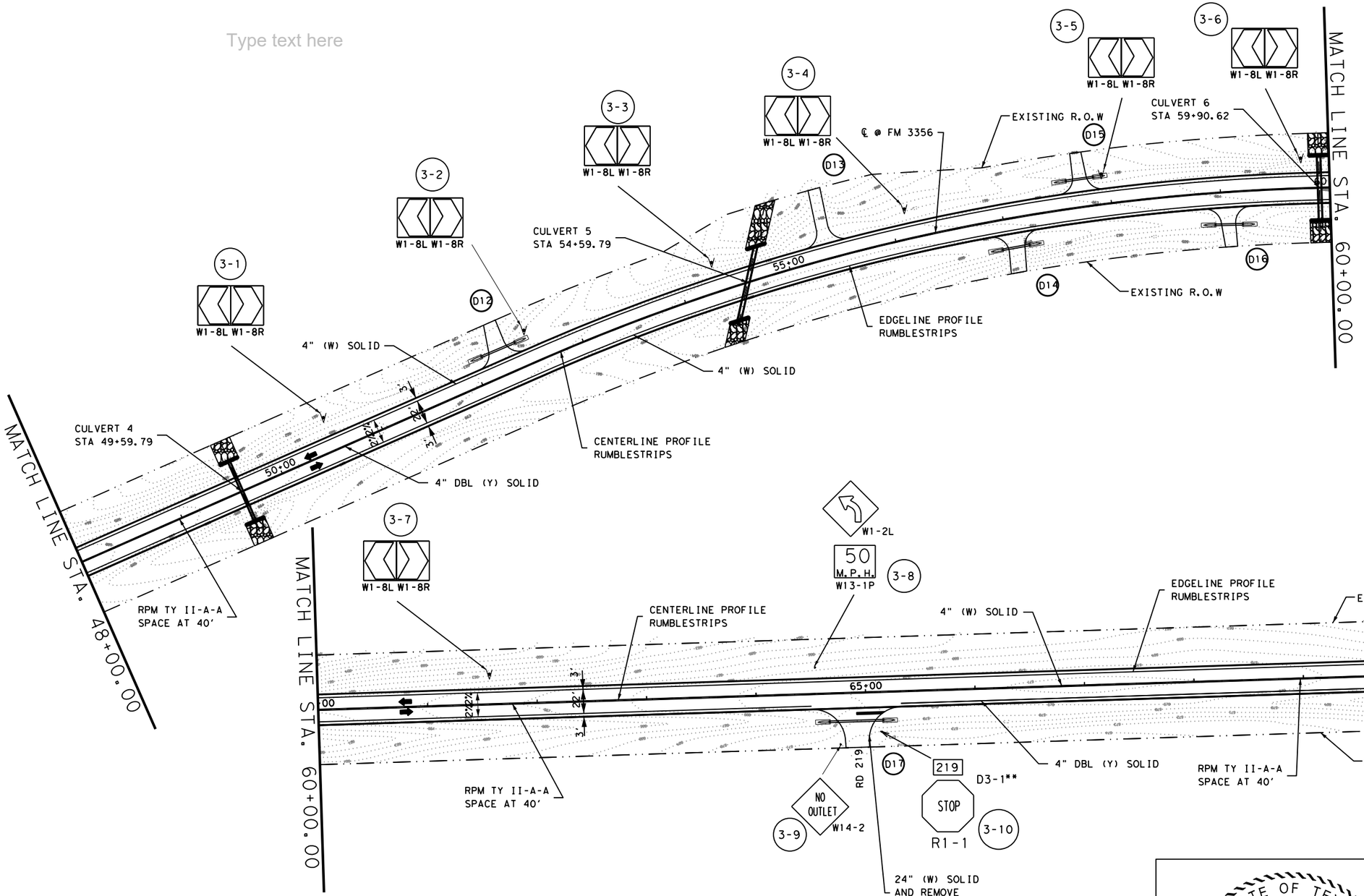
Texas Department of Transportation

FM 3356
SIGN & PAVEMENT MARKING LAYOUT
FM 24+00 TO 48+00

SCALE: 1"=100' SHEET 2 OF 7

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	86
	3427	03	007	

Type text here



NOTES:
** SALVAGE SIGNS AND REINSTALL ON NEW POST.

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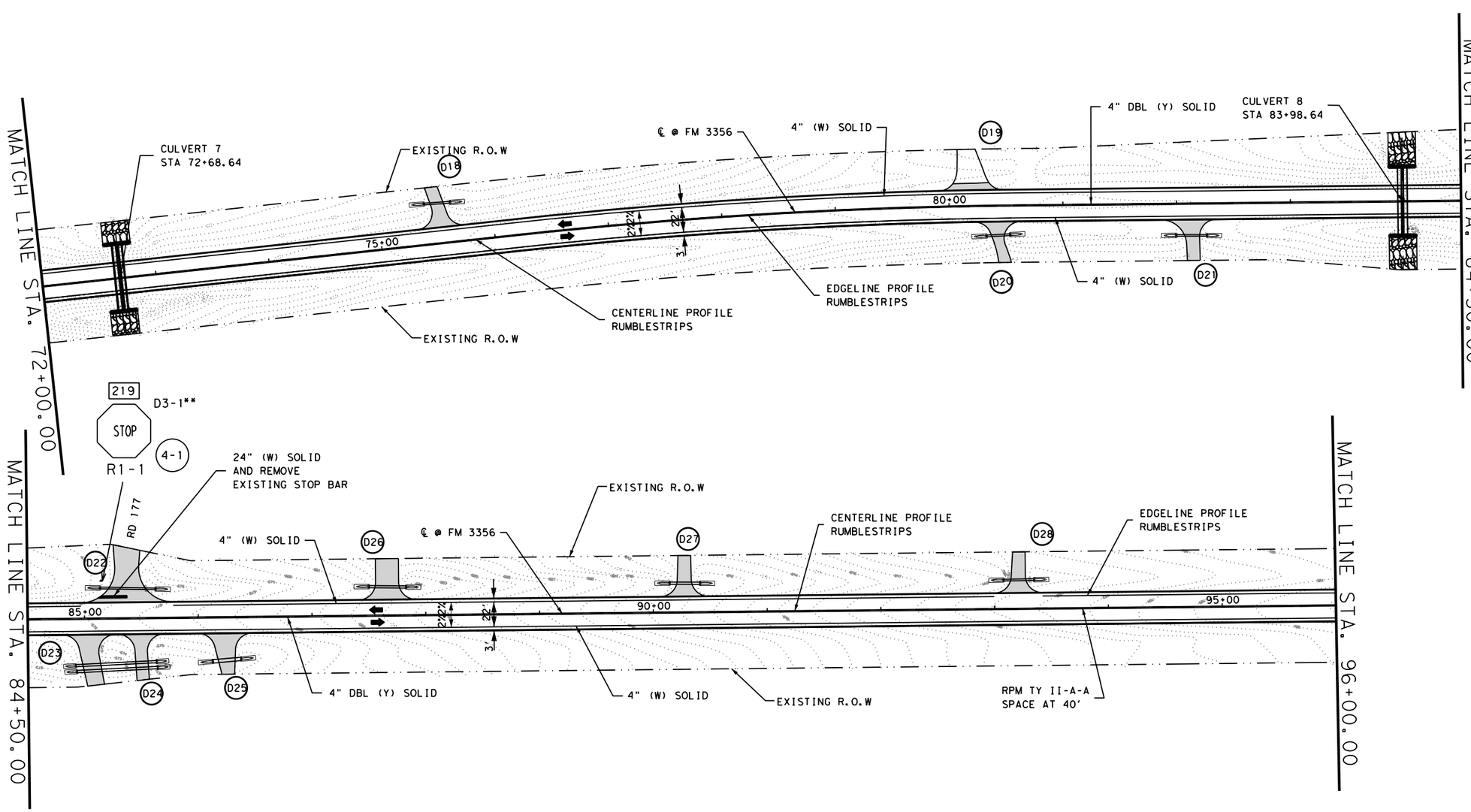
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

FM 3356
SIGN & PAVEMENT MARKING LAYOUT
STA 48+00 TO 72+00

SHEET 3 OF 7

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS: CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK: MS	TEXAS	DALLAS	COLLIN	
CHECK: JRV	CONTROL	SECTION	JOB	87
	3427	03	007	



NOTES:
** SALVAGE SIGNS AND REINSTALL ON NEW POST.

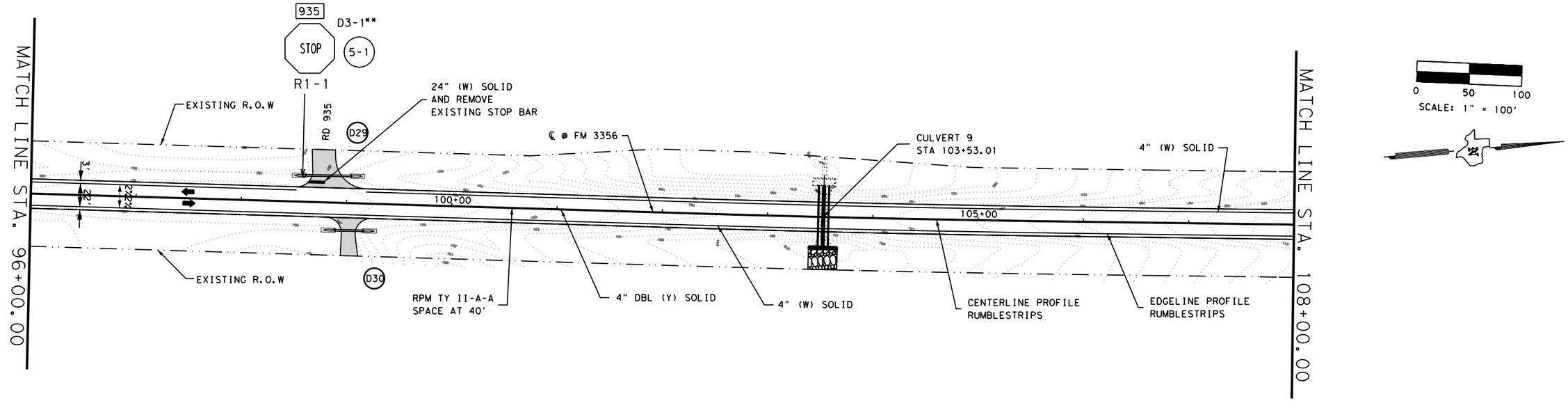
STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

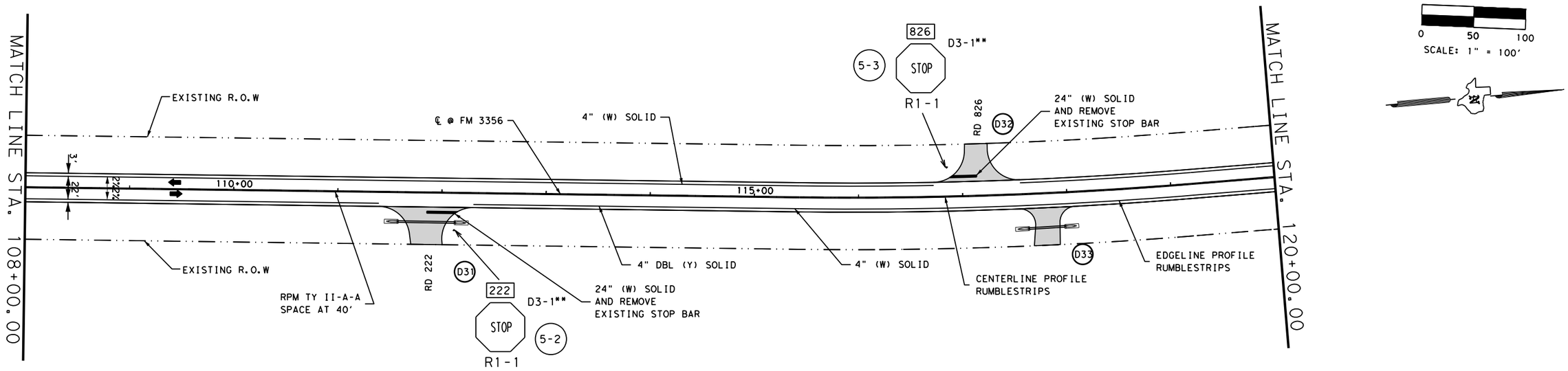
Texas Department of Transportation

FM 3356
SIGN & PAVEMENT MARKING LAYOUT
STA 72+00 TO 96+00

SHEET 4 OF 7

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS: CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK: MS	TEXAS	DALLAS	COLLIN	
CHECK: JRV	CONTROL	SECTION	JOB	88
	3427	03	007	





NOTES:
** SALVAGE SIGNS AND REINSTALL ON NEW POST.

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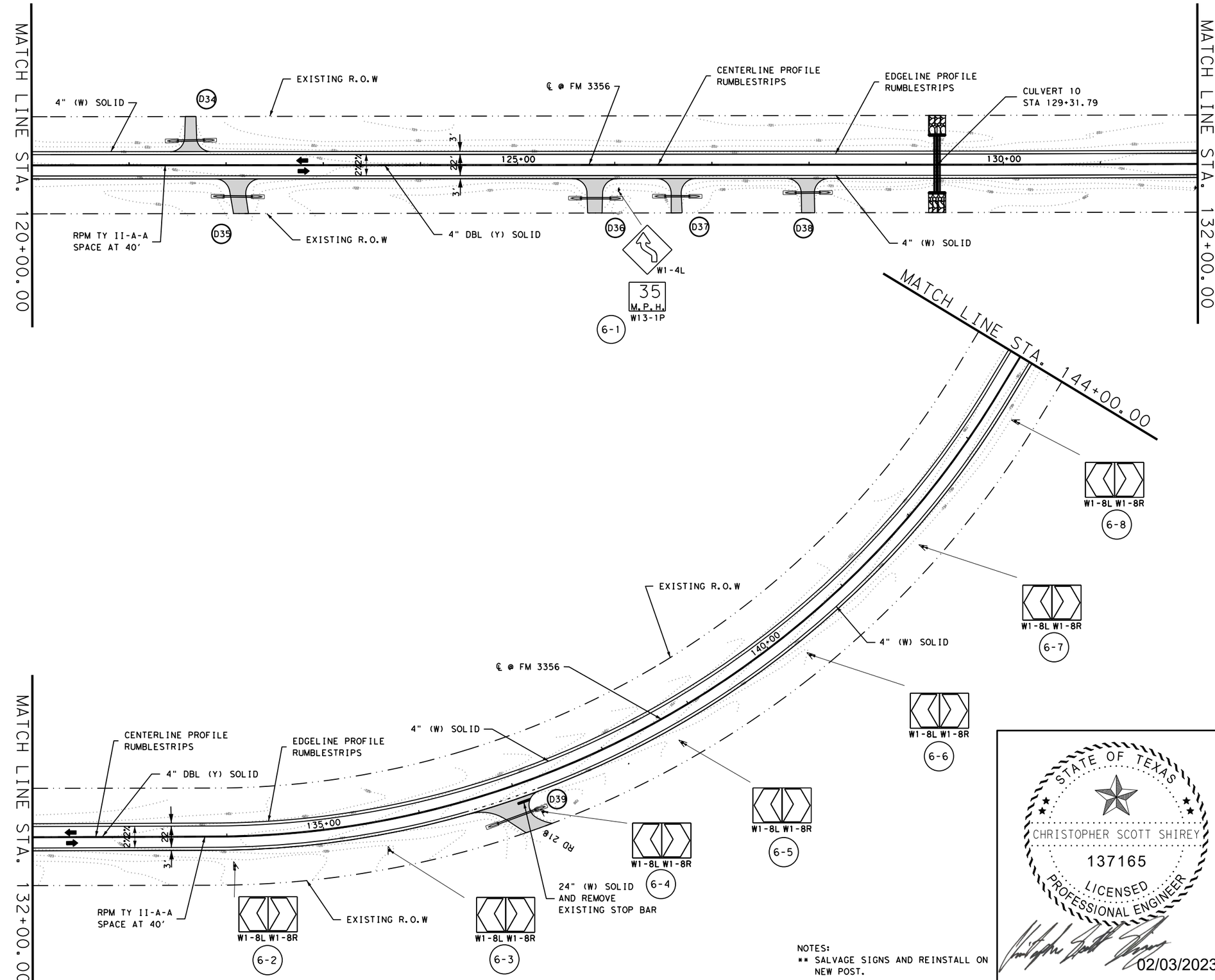
02/03/2023

Texas Department of Transportation

FM 3356
SIGN & PAVEMENT MARKING LAYOUT
STA 96+00 TO 120+00

SHEET 5 OF 7

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS: CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK: MS	TEXAS	DALLAS	COLLIN	
CHECK: JRV	CONTROL	SECTION	JOB	89
	3427	03	007	



0 50 100
SCALE: 1" = 100'

0 50 100
SCALE: 1" = 100'

NOTES:
** SALVAGE SIGNS AND REINSTALL ON NEW POST.

STATE OF TEXAS
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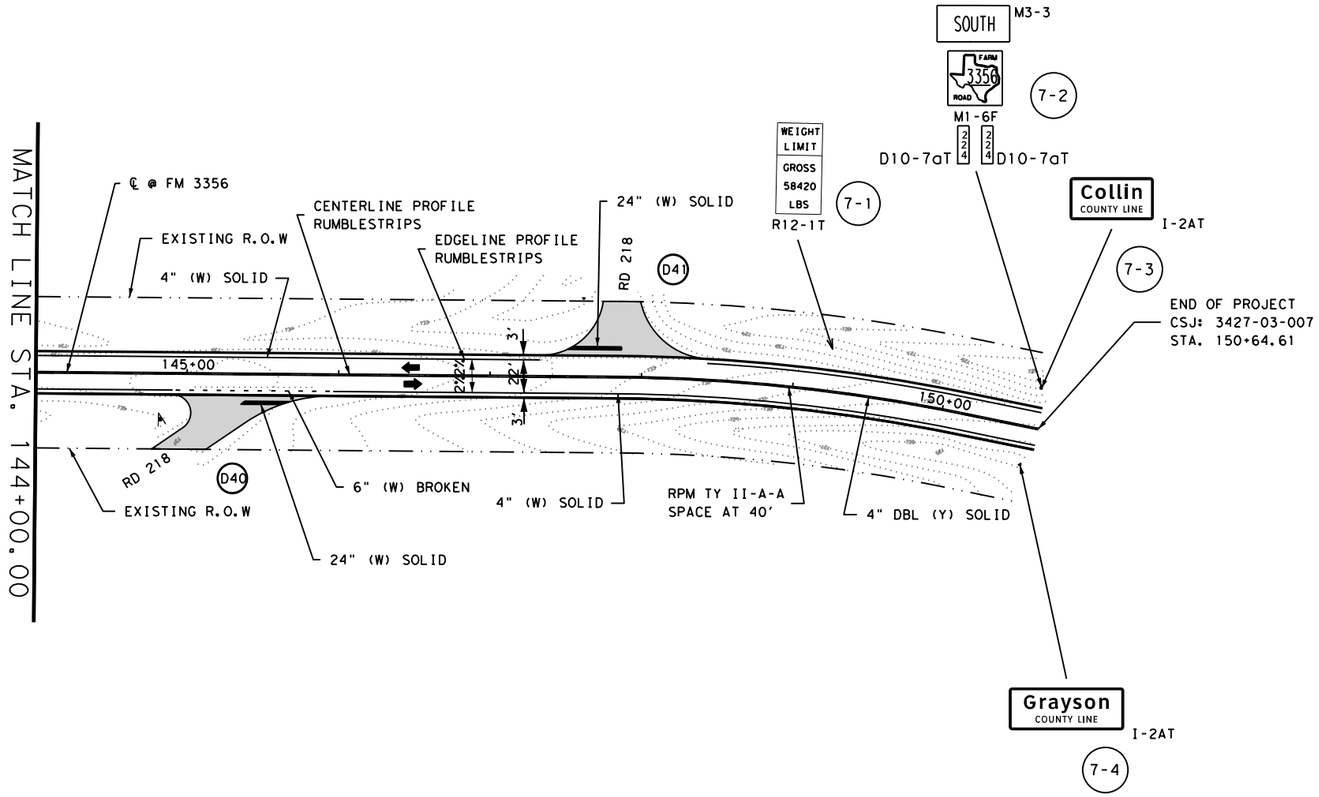
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

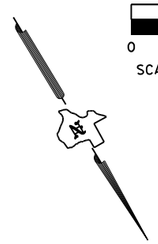
Texas Department of Transportation

FM 3356
SIGN & PAVEMENT MARKING LAYOUT
STA 120+00 TO 144+00

SHEET 6 OF 7

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	90
	3427	03	007	





0 50 100
SCALE: 1" = 100'

NOTES:
** SALVAGE SIGNS AND REINSTALL ON NEW POST.

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PROFESSIONAL ENGINEER
02/03/2023

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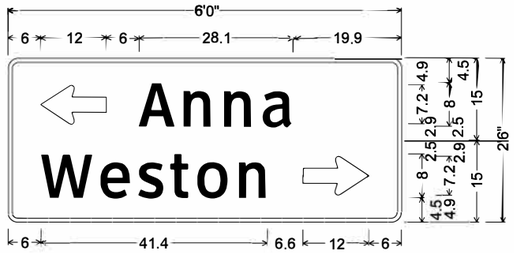
FM 3356
SIGN & PAVEMENT MARKING LAYOUT
STA 144+00 TO 150+64.61

SHEET 7 OF 7

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	91
	3427	03	007	

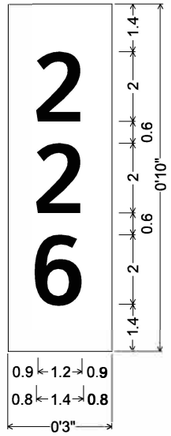


D1-2 8in LT-RT;

1.9" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 12.0" X 7.1" 180°;
"Anna", ClearviewHwy-3-W;

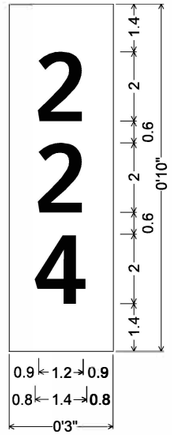
1.9" Radius, 0.8" Border, White on Green;
"Weston", ClearviewHwy-3-W;
Standard Arrow Custom 12.0" X 7.1" 0°;

SHEET 1 SIGN 2



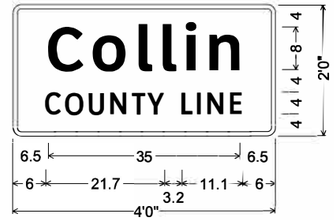
D10-7aT 3in;
No border, White on Green;
"2", ClearviewHwy-4-W;
"2", ClearviewHwy-4-W;
"6", ClearviewHwy-4-W;

SHEET 2 SIGN 7



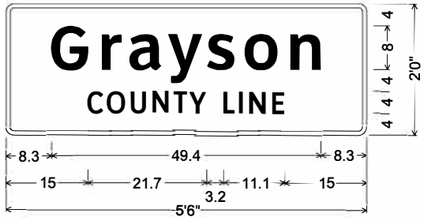
D10-7aT 3in;
No border, White on Green;
"2", ClearviewHwy-4-W;
"2", ClearviewHwy-4-W;
"4", ClearviewHwy-4-W;

SHEET 7 SIGN 2



I-2dT 8in;
1.5" Radius, 0.8" Border, White on Green;
"Collin", ClearviewHwy-5-W-R;
"COUNTY LINE", ClearviewHwy-3-W;

SHEET 7 SIGN 3



I-2dT 8in;
1.5" Radius, 0.8" Border, White on Green;
"Grayson", ClearviewHwy-5-W-R;
"COUNTY LINE", ClearviewHwy-3-W;

SHEET 7 SIGN 4

STATE OF TEXAS
MATTHEW RYAN MESTRE
142175
LICENSED PROFESSIONAL ENGINEER

Matthew Ryan Mestre, P.E. 1/25/2023
Signature of Registrant Date

Texas Department of Transportation

GUIDE SIGN DETAILS

SCALE: NTS SHEET 1 OF 1

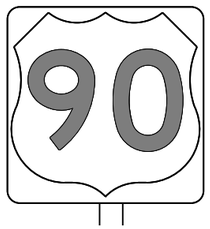
DESIGN/CK	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
MRM	6	SEE TITLE SHEET		FM 3356
CHECK MRM	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MAA	TEXAS	DALLAS	COLLIN	92
CHECK BA	CONTROL 3427	SECTION 03	JOB 007	

$DATE$ $TIME$ $FILE$

DATE: $DATE$ $TIME$
FILE: $FILE$

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

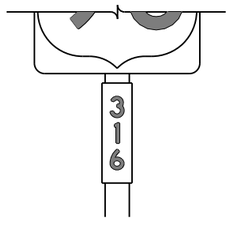
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING

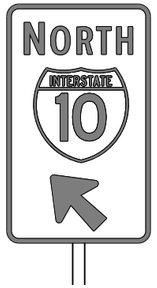


TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING





TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).
4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.
6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

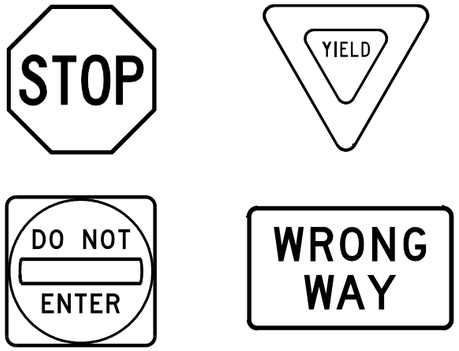
FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	DAL	COLLIN		93

DATE: $DATE$
FILE: $FILE$

$TIME$

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

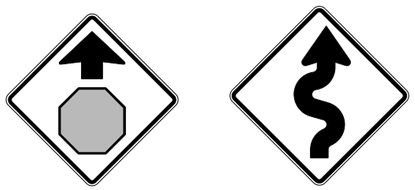
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

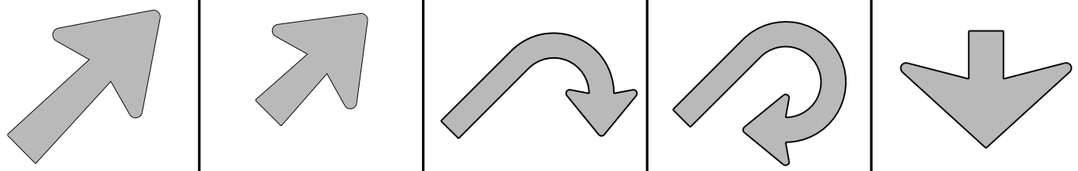
TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
12-03 7-13 9-08	DIST	COUNTY		SHEET NO.
	DAL	COUNTY		94

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

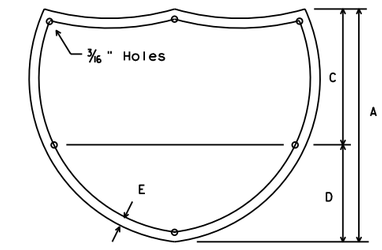
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

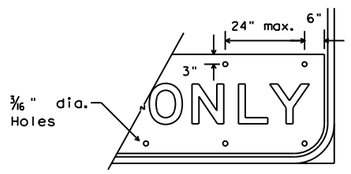
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

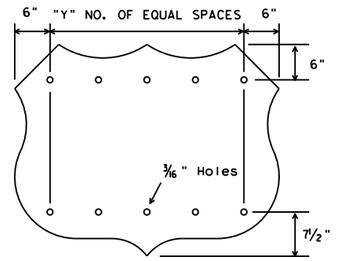


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

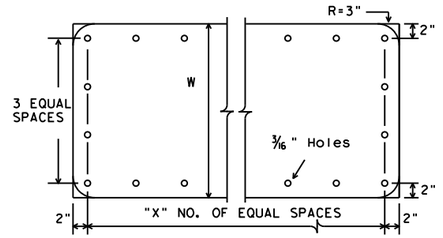


EXIT ONLY PANEL



U.S. ROUTE MARKERS

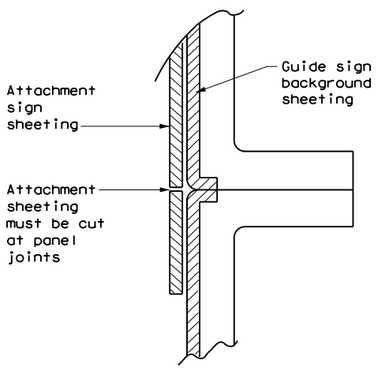
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

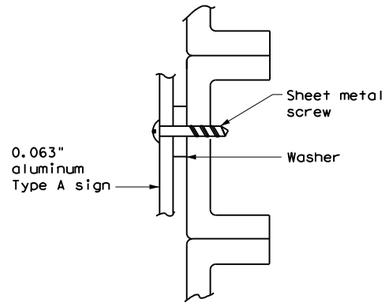
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



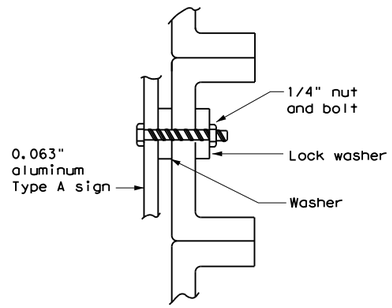
DIRECT APPLIED ATTACHMENT

NOTE:

1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT



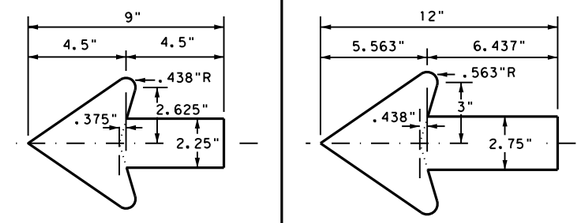
NUT/BOLT ATTACHMENT

NOTE:

Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.

Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	DAL	COLLIN		95

DATE: $DATE$ $TIME$
FILE: $FILE$

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

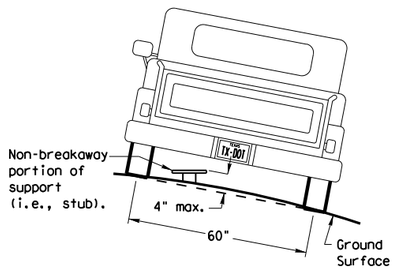
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

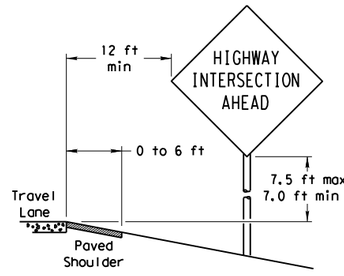
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

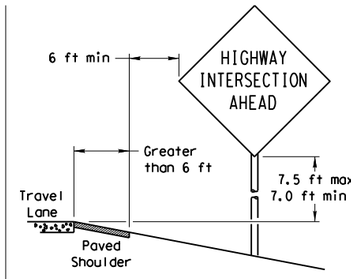
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

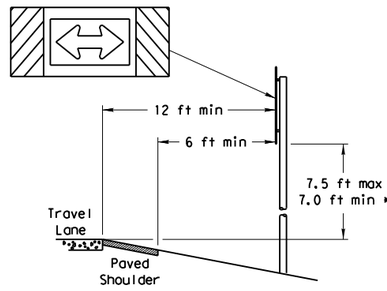
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



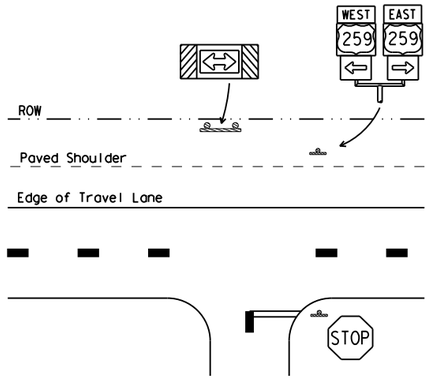
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

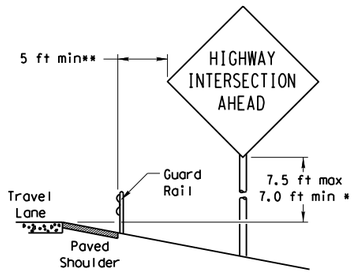
T-INTERSECTION



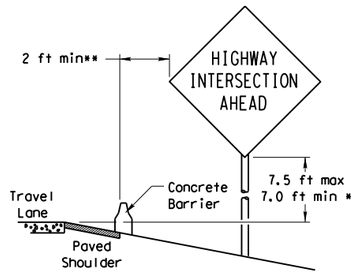
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

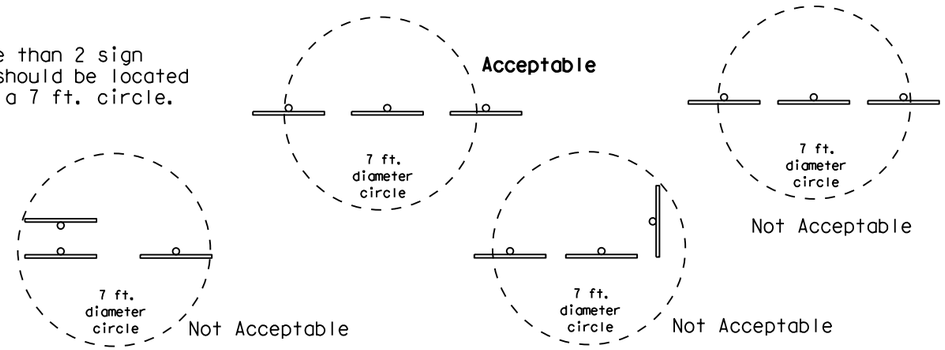
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

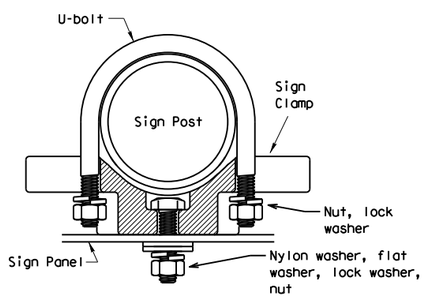
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

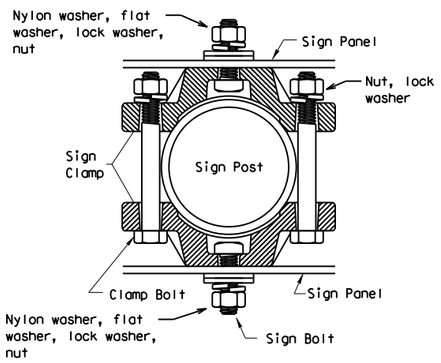


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

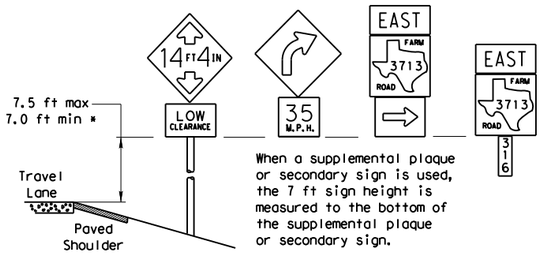
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



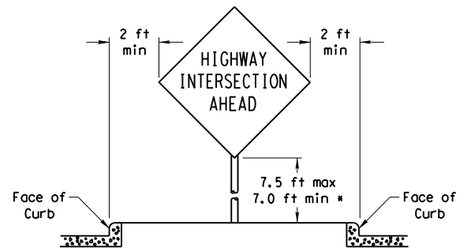
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



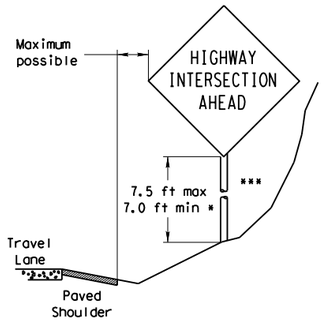
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS
9-08

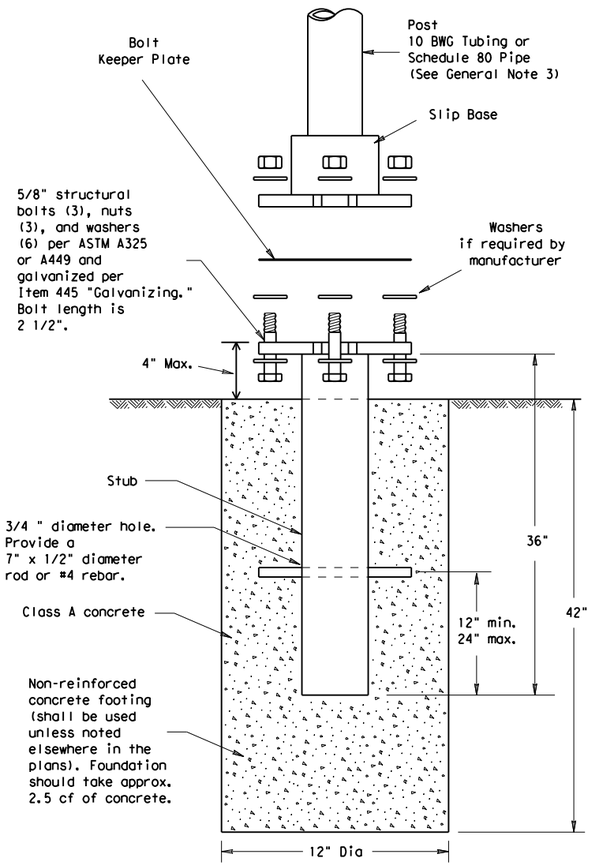
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
3427	03	007	FM 3356

DIST	COUNTY	SHEET NO.
DAL	COLLIN	96

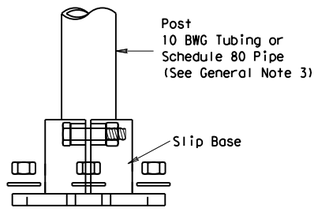
DATE: $DATE$ $TIME$
FILE: $FILE$

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS

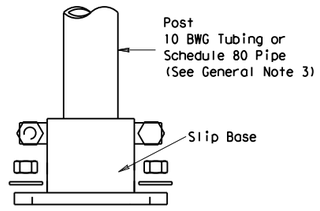


SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

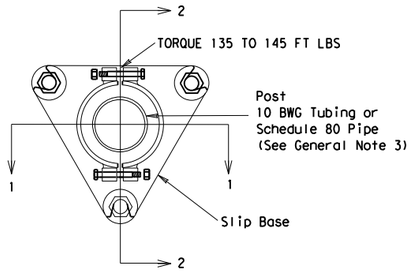
NOTE
The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.



SIDE VIEW 1-1



SIDE VIEW 2-2



TOP VIEW

DETAIL A

GENERAL NOTES:

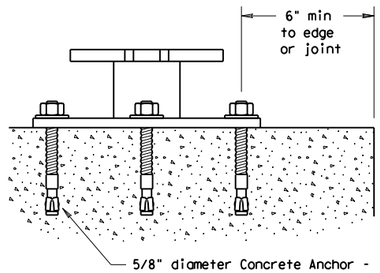
1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   0.134" nominal wall thickness
   Seamless or electric-resistance welded steel tubing or pipe
   Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   Other steels may be used if they meet the following:
   55,000 PSI minimum yield strength
   70,000 PSI minimum tensile strength
   20% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
   Schedule 80 Pipe (2.875" outside diameter)
   0.276" nominal wall thickness
   Steel tubing per ASTM A500 Gr C
   Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
   46,000 PSI minimum yield strength
   62,000 PSI minimum tensile strength
   21% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is:
   http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

ADDED DETAIL A FOR CLAMP BASE
10-2010

DATE:
FILE:

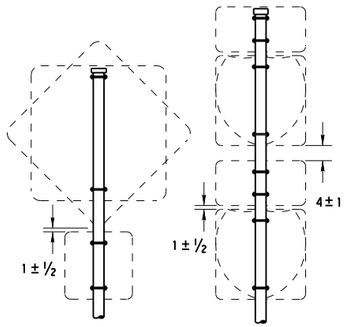
Texas Department of Transportation
Dallas District Standard

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

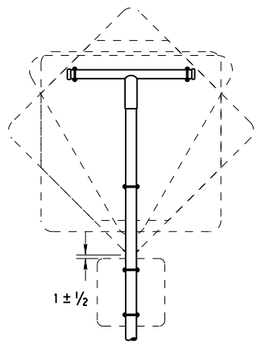
SMD(SLIP-1)-08(DAL)

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

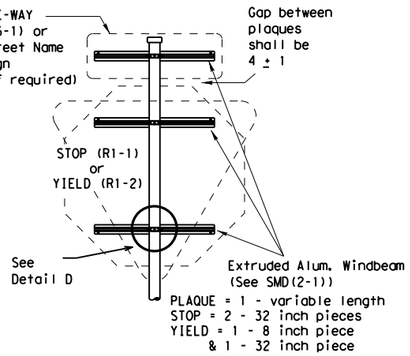
9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
12-10 (DISTRICT) ADDED CLAMP BASE DETAIL FOR SLIP BASE INSTALLATION	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		97



SM RD SGN ASSM TY XXXXX(1)XX(P)

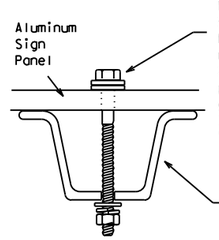


SM RD SGN ASSM TY XXXXX(1)XX(T)



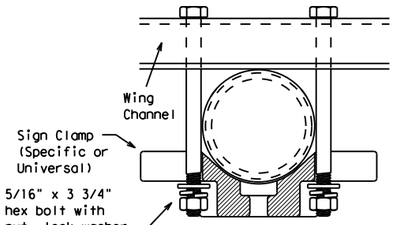
PLAQUE = 1 - variable length
STOP = 2 - 32 inch pieces
YIELD = 1 - 8 inch piece
& 1 - 32 inch piece

SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



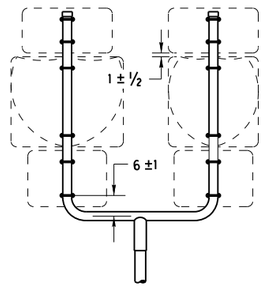
Top View

Detail A

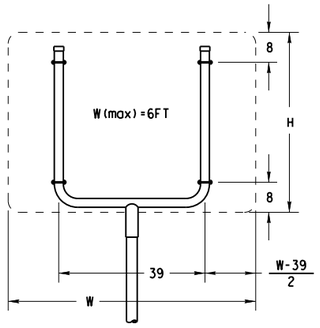


Top View

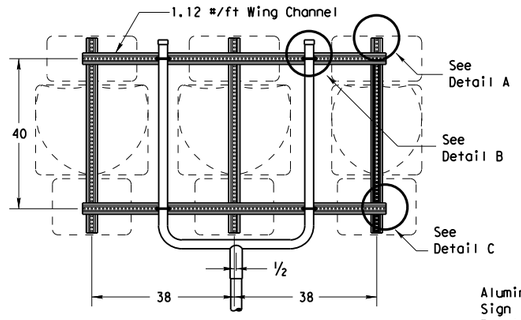
Detail B



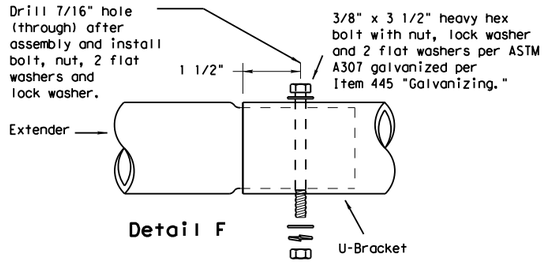
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

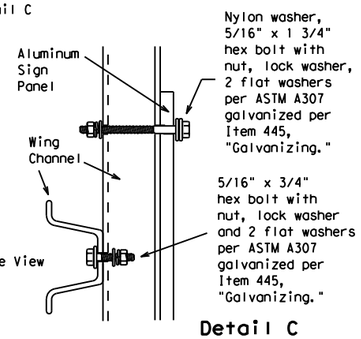


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

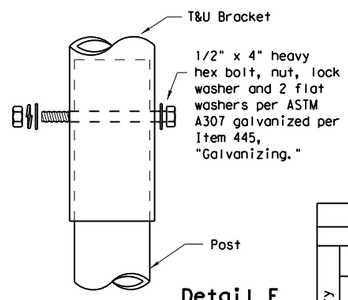


Detail F

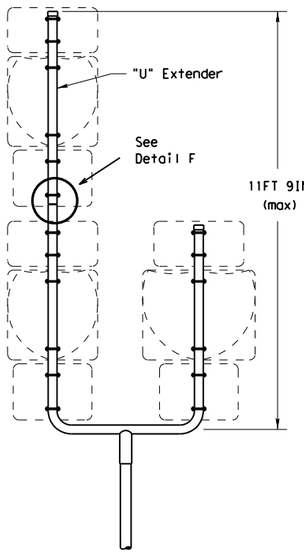
Splices shall only be allowed behind the sign substrate.



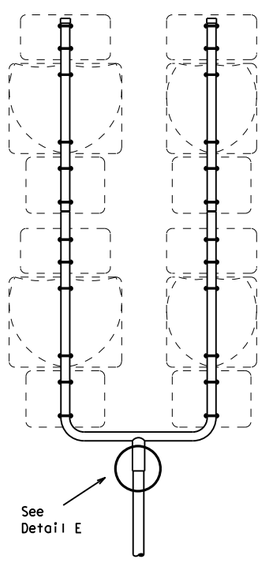
Detail C



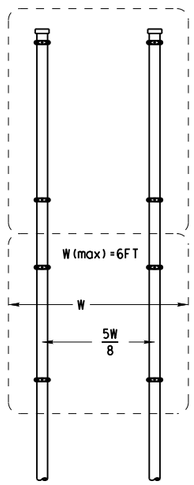
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

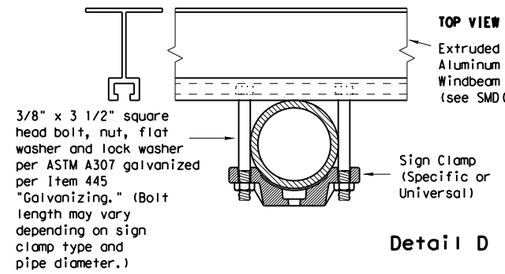


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

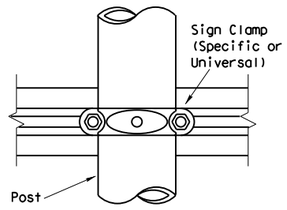


SM RD SGN ASSYM TY XXXXX(2)XX(P)

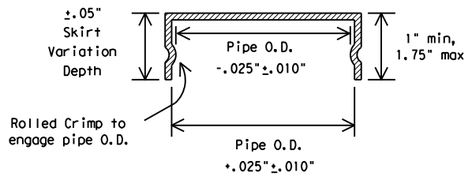
SIDE VIEW



Detail D



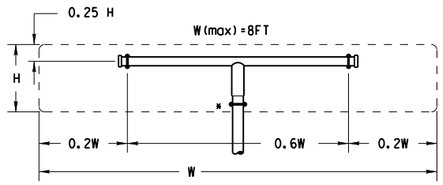
FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.



SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

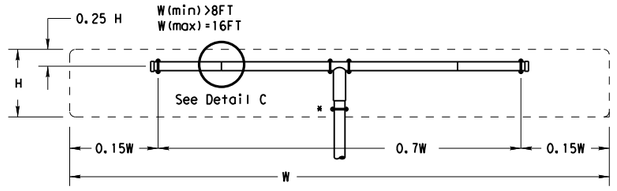
DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT

CONT	SECT	JOB	HIGHWAY
3427	03	007	FM 3356

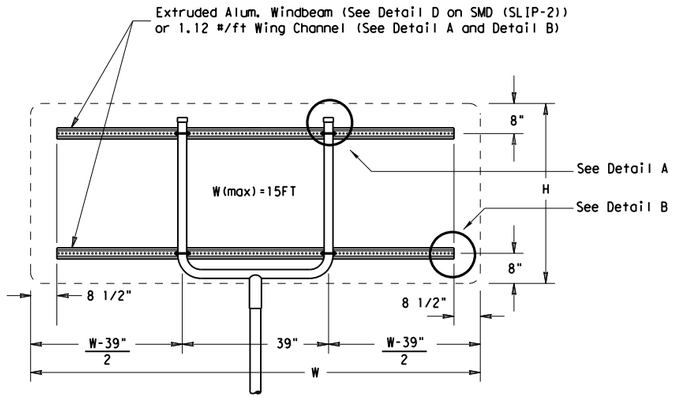
DIST	COUNTY	SHEET NO.
DAL	COLLIN	98

9-08 REVISIONS

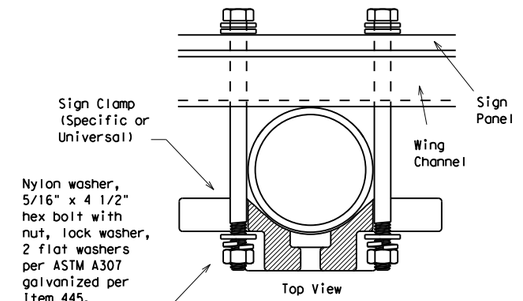
DATE: $DATE$ $TIME$
FILE: $FILE$



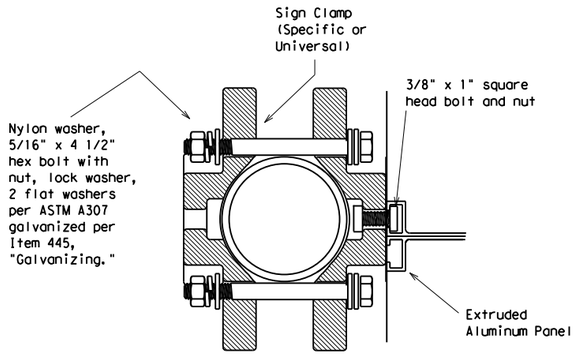
SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



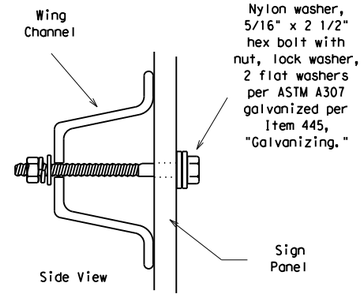
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



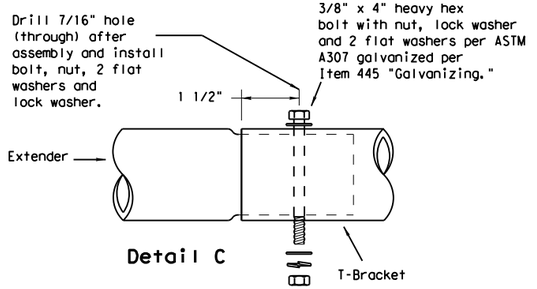
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

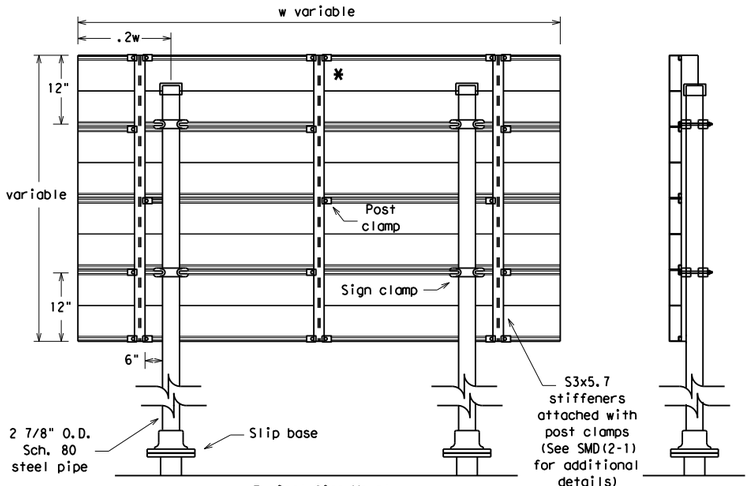


Detail B



Detail C

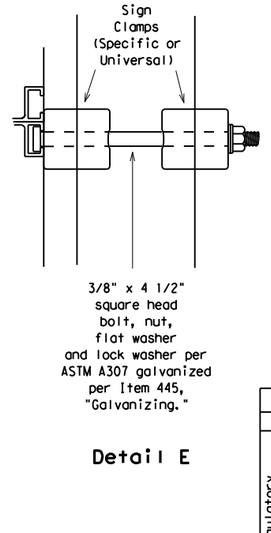
Splices shall only be allowed behind the sign substrate.



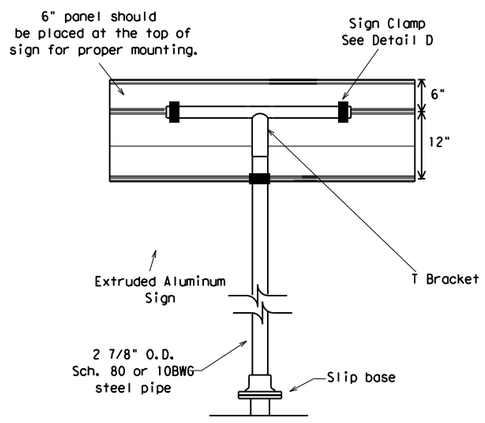
Typical Sign Mount

SM RD SGN ASSM TY S80(2)XX(P-EXAL)

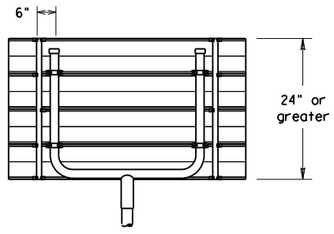
* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.



Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

1. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
6. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
11. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

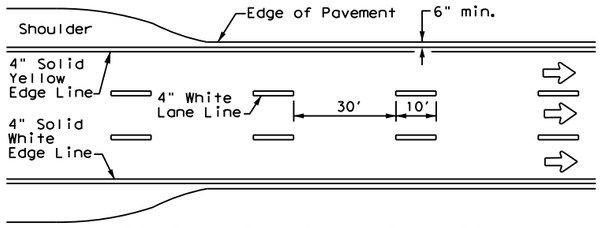
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
3427	03	007	FM 3356

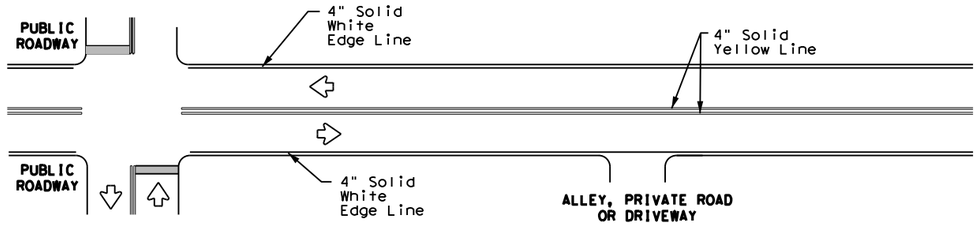
DIST	COUNTY	SHEET NO.
DAL	COLLIN	99

REVISIONS
9-08

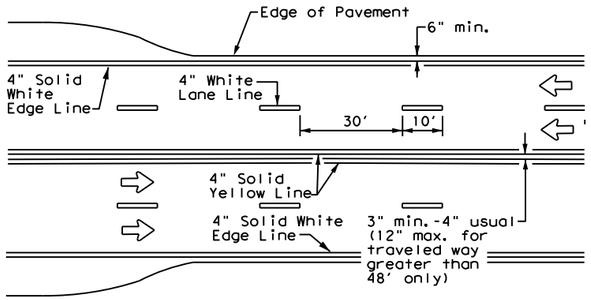
DATE: $DATE$ $TIME$
FILE: $FILE$



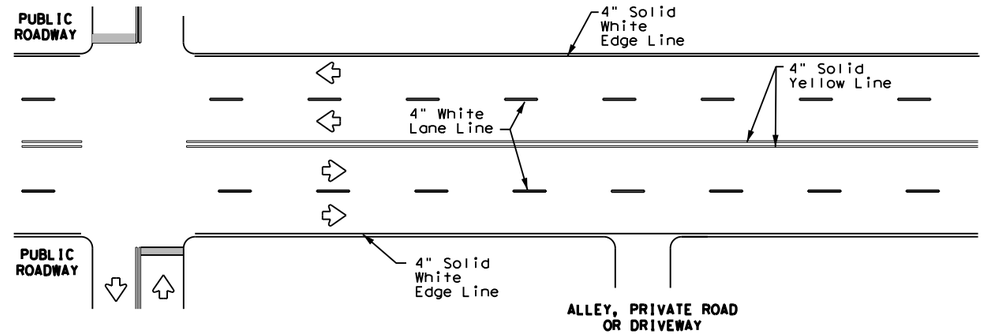
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



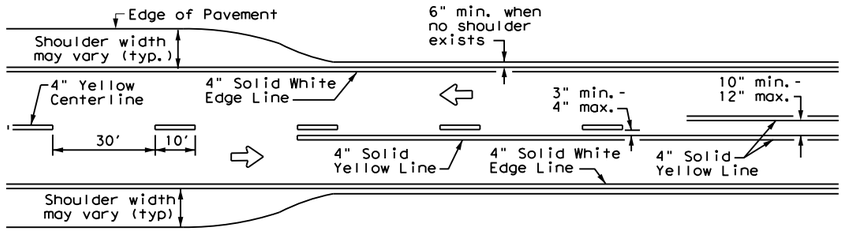
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



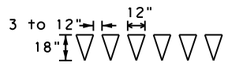
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



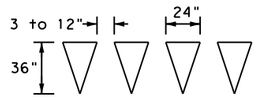
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

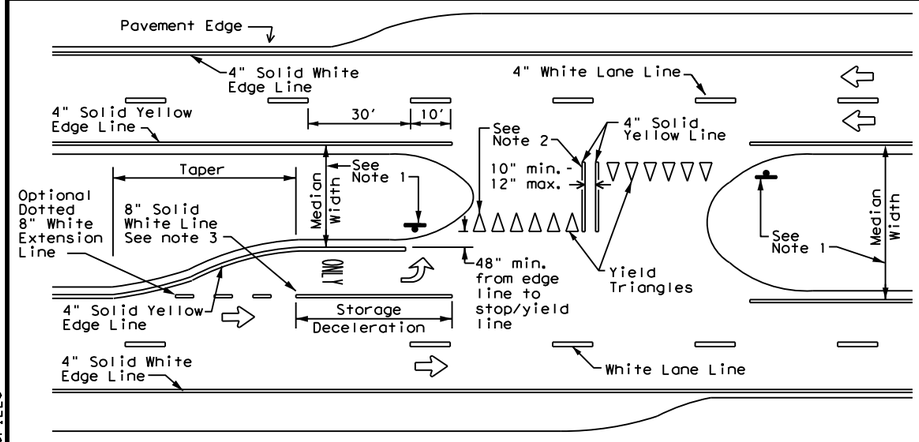


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

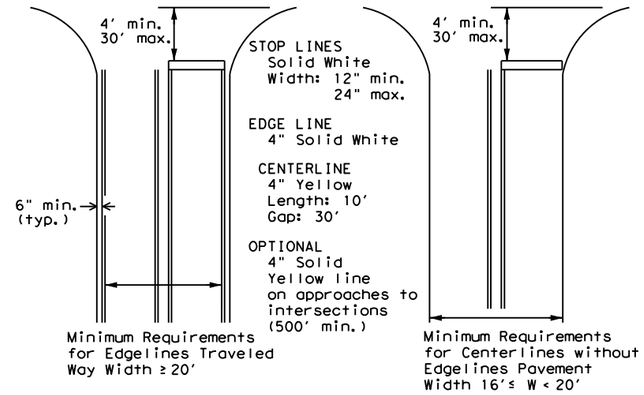
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

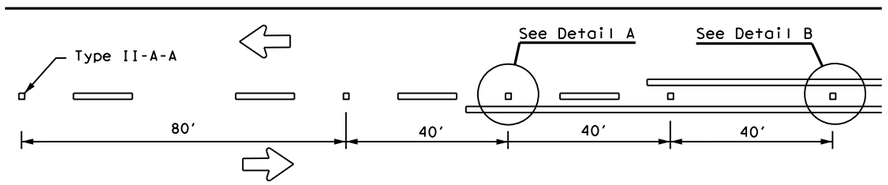
PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	3427	03	007	FM 3356
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	DAL	COLLIN		100

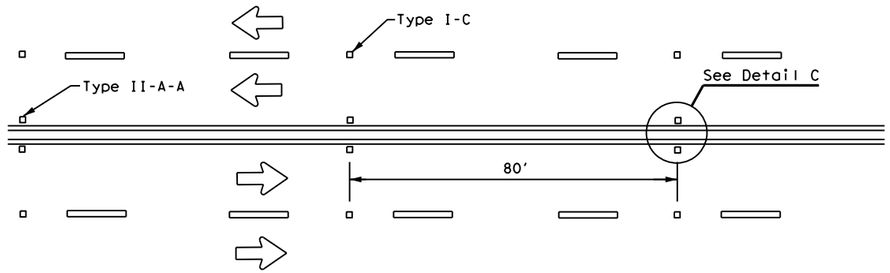
22A

DATE: $DATE$ $TIME$
FILE: $FILE$

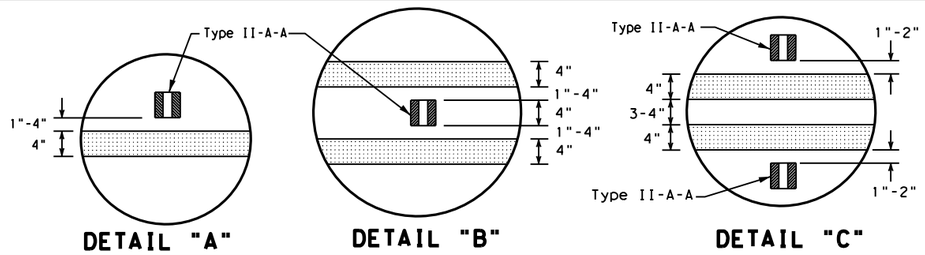
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



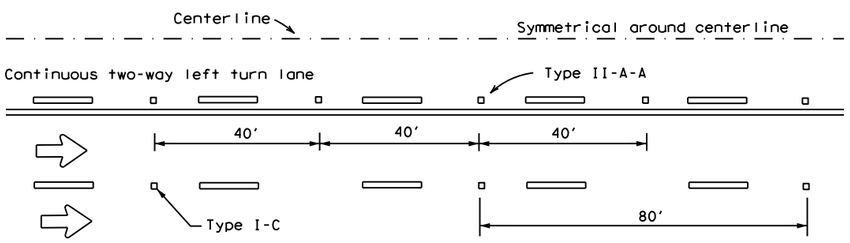
CENTERLINE FOR ALL TWO LANE ROADWAYS



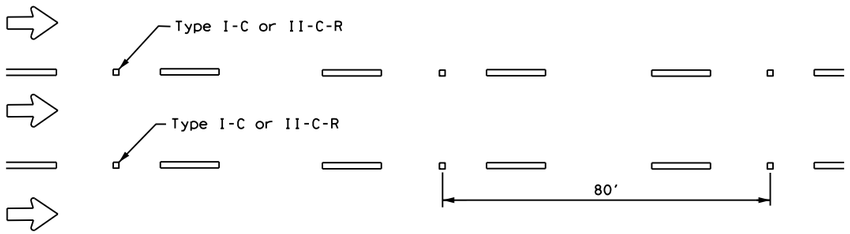
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

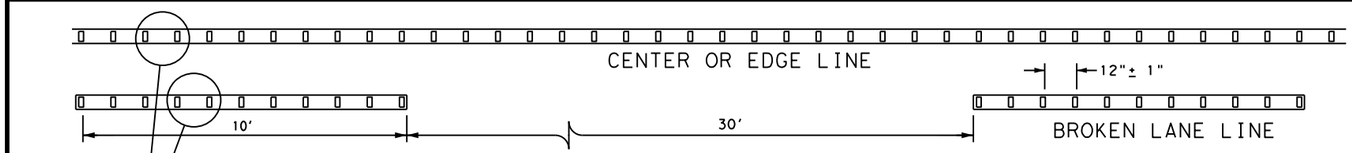


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



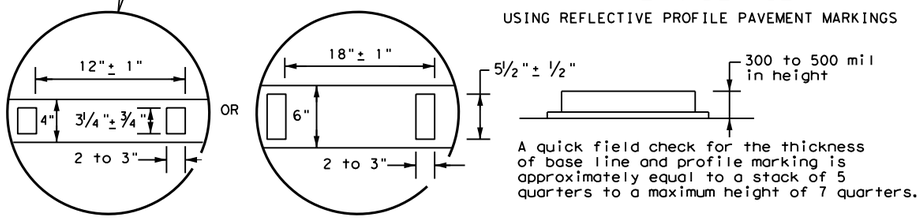
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTE

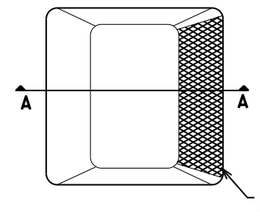
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

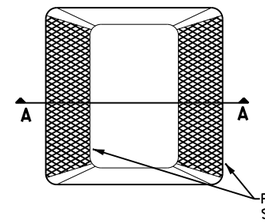
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

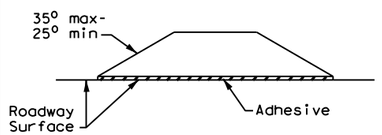
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

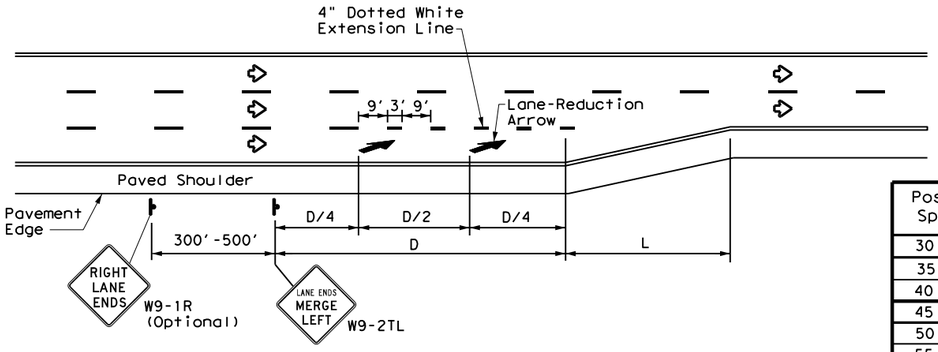
Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10 5-00 2-12 8-00 6-20	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		101

22B

DATE: $DATE$ $TIME$
FILE: $FILE$

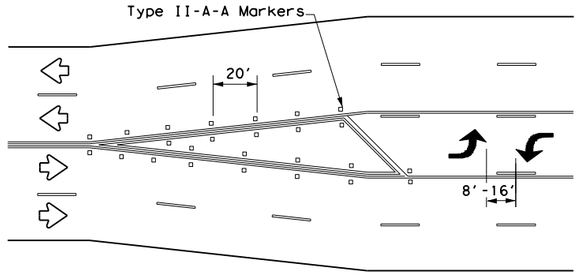


LANE REDUCTION

Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.



A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

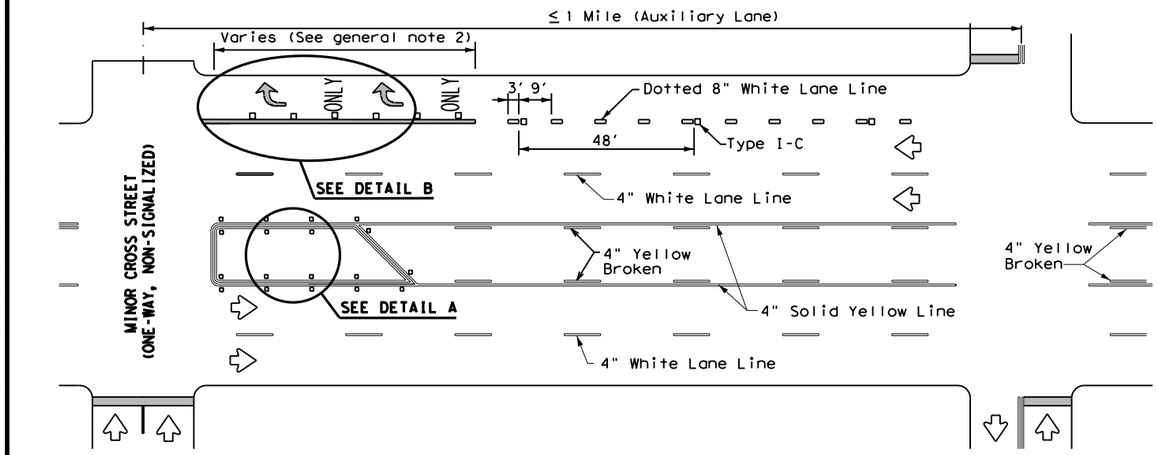
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

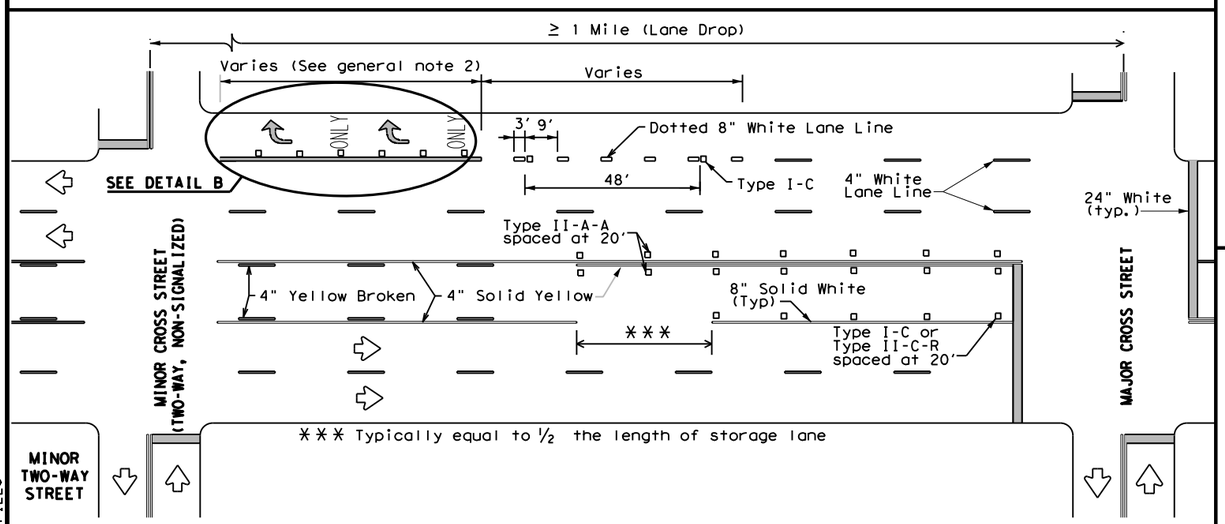
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

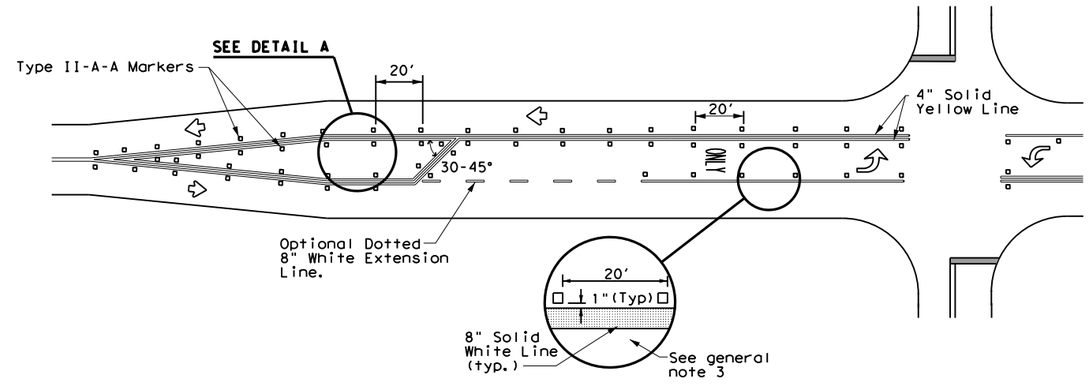
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



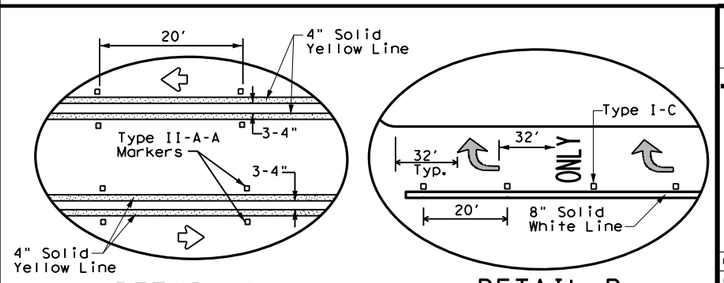
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

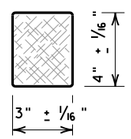
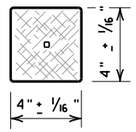
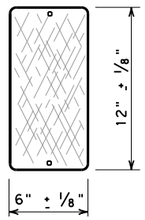
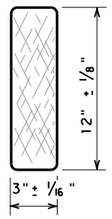
PM(3)-20

FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	DAL	COLLIN		102
3-03 6-20				

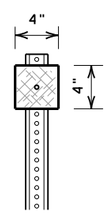
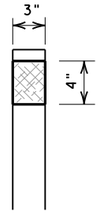
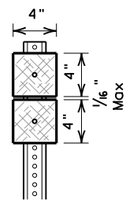
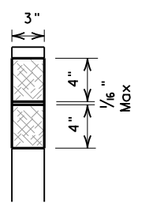
220

DATE: $DATE$ $TIME$
FILE: $FILE$

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

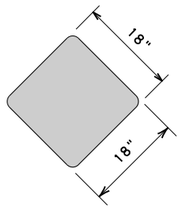
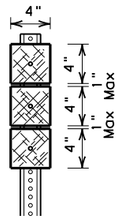
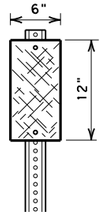
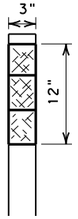
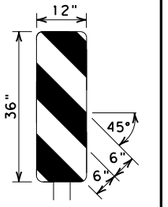
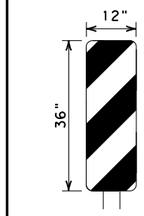
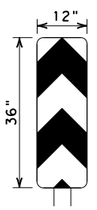
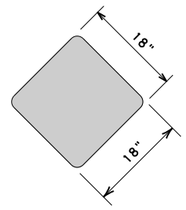
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

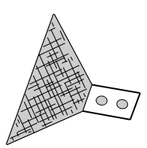
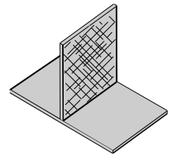
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

DEPARTMENTAL MATERIAL SPECIFICATIONS

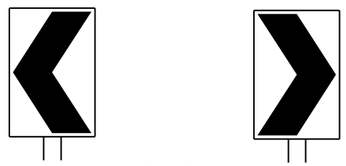
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE



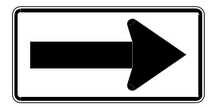
W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE



W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	DAL	COLLIN		103

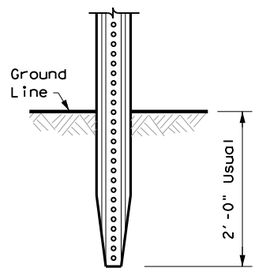
20A

DATE: $DATE$ $TIME$
FILE: $FILE$

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

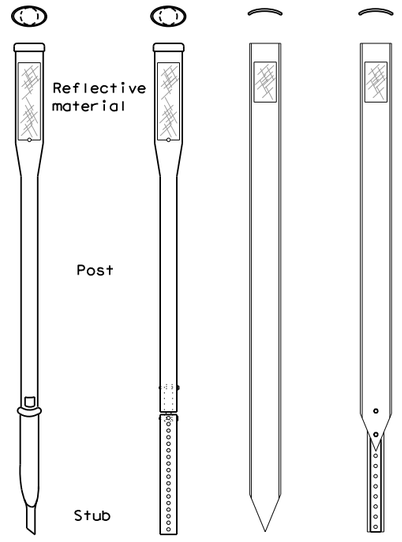


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

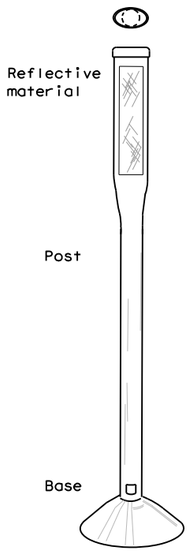
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



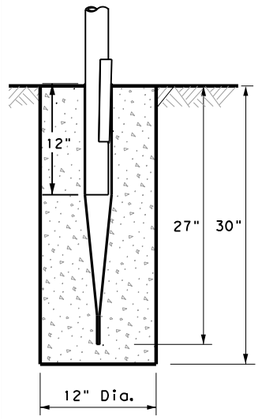
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

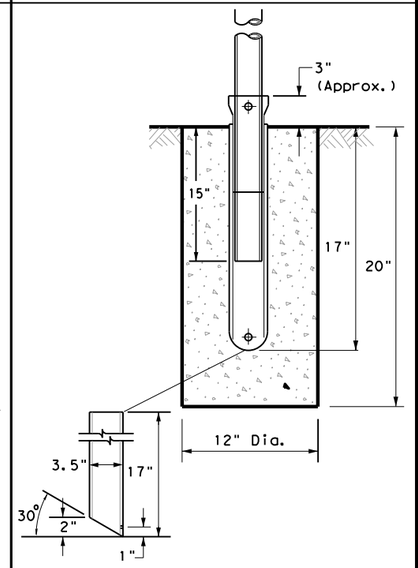
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

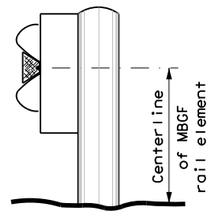
NOTE

1. Install per manufacturer's recommendations.

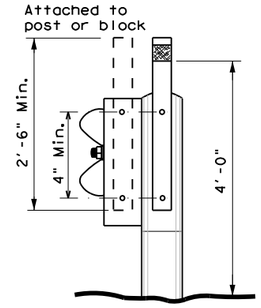
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

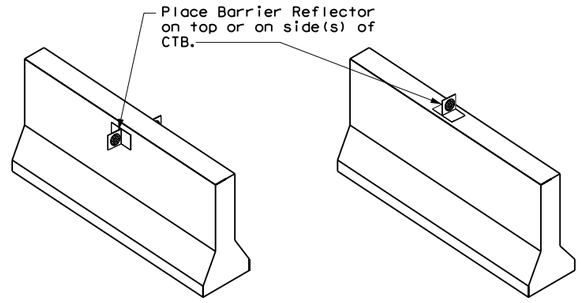
GF1



GF2



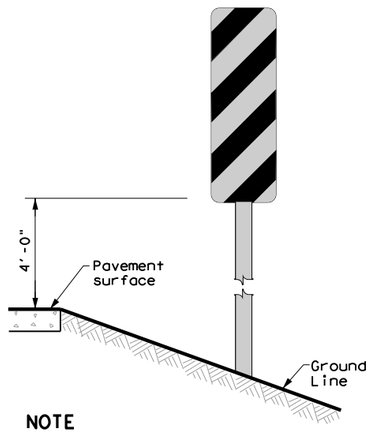
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

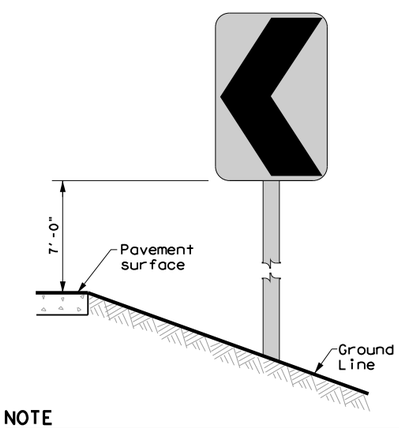
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

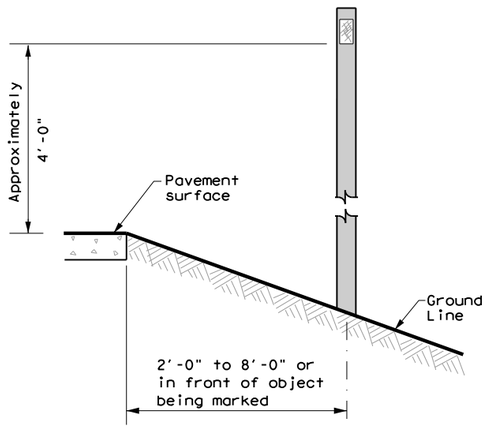
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	DAL	COLLIN		104

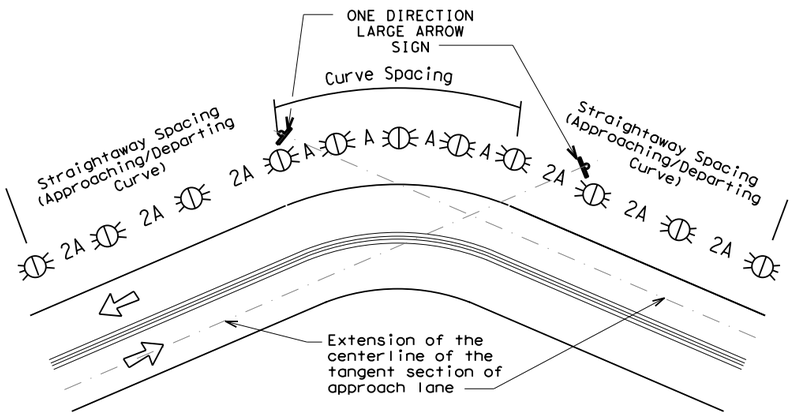
20B

DATE: $DATE$ $TIME$
FILE: $FILE$

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

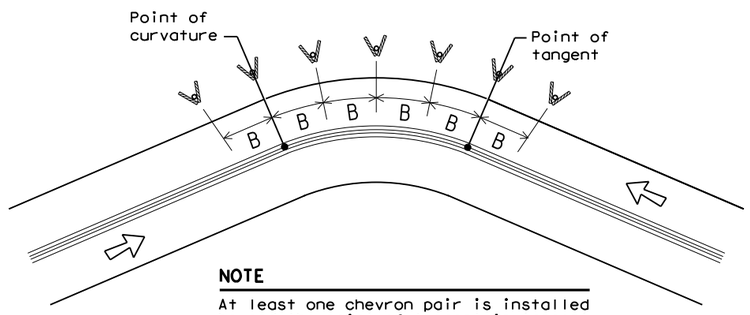
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

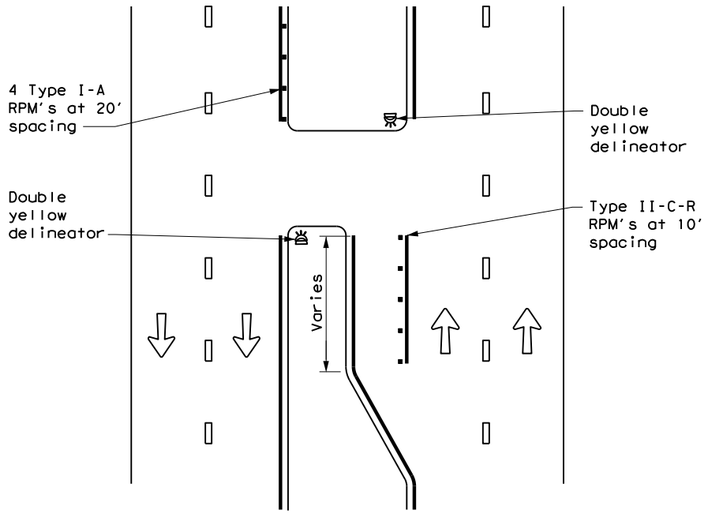
D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	DAL	COLIN		105

20C

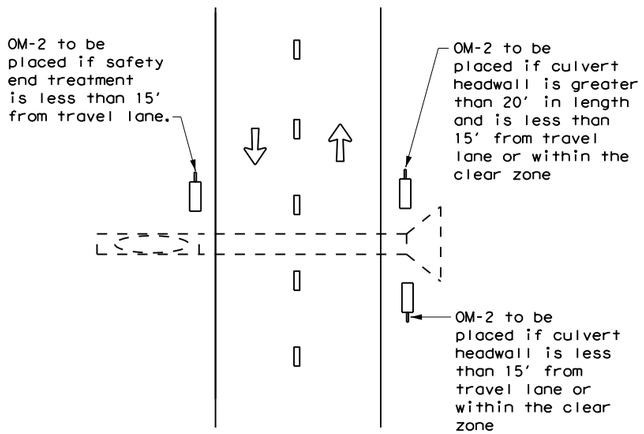
DATE: $DATE$ $TIME$
FILE: $FILE$

CROSSOVERS



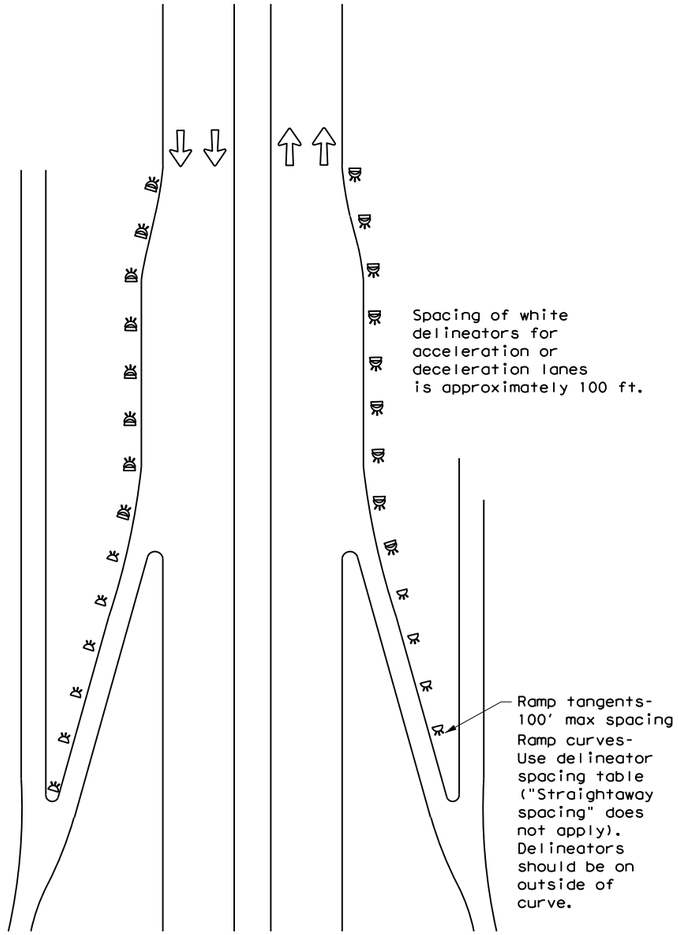
DETAIL 1

FOR CULVERTS WITHOUT MBGF



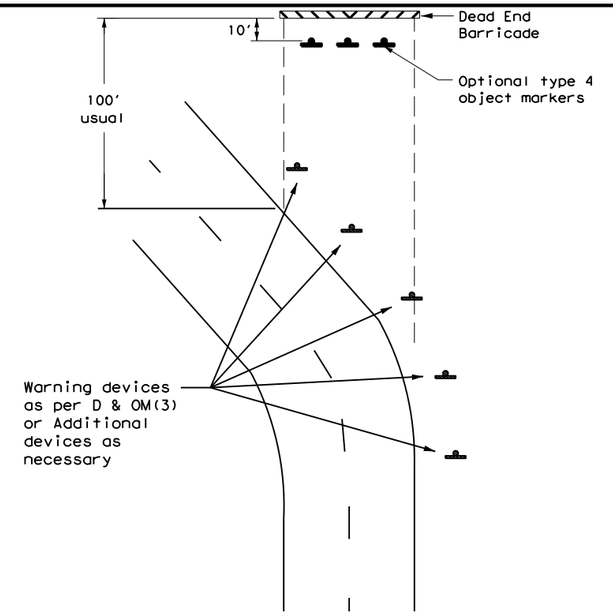
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



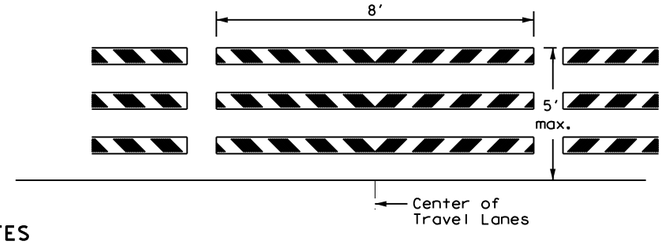
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

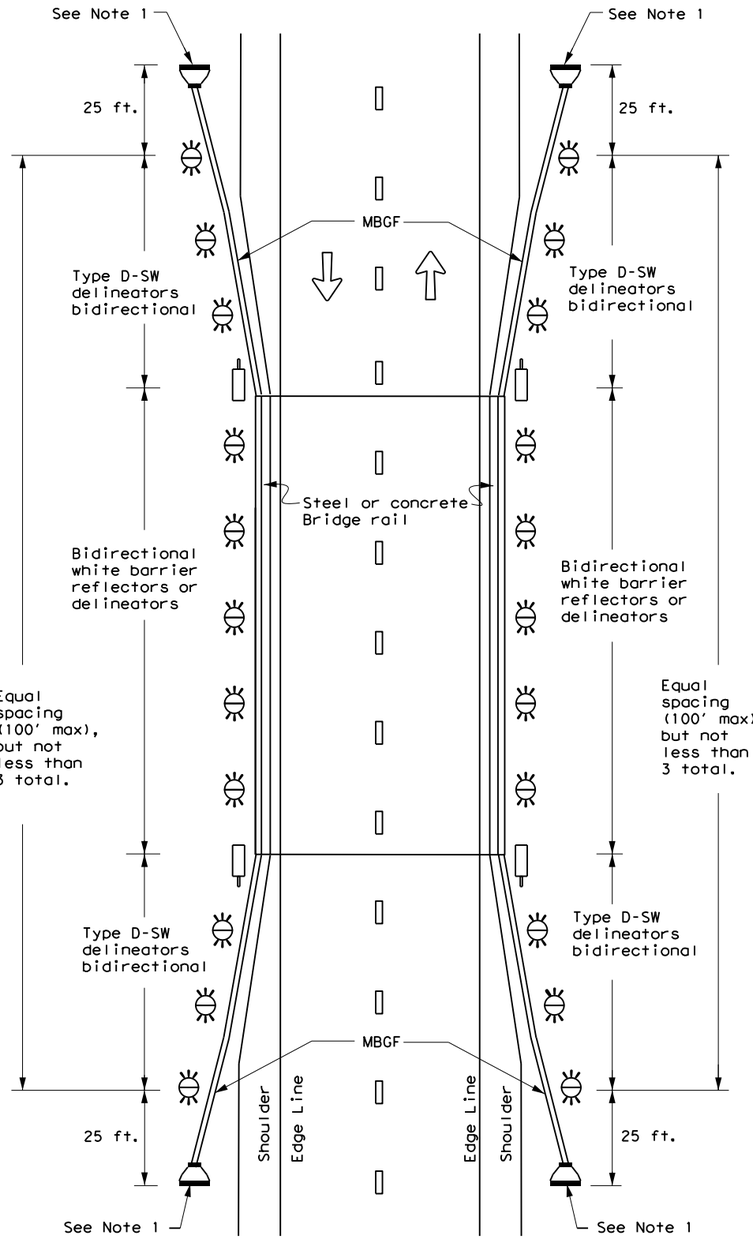
D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
3-15	DIST	COUNTY		SHEET NO.
7-20	DAL	COLLIN		106

20D

DATE: $DATE$ $TIME$
FILE: $FILE$

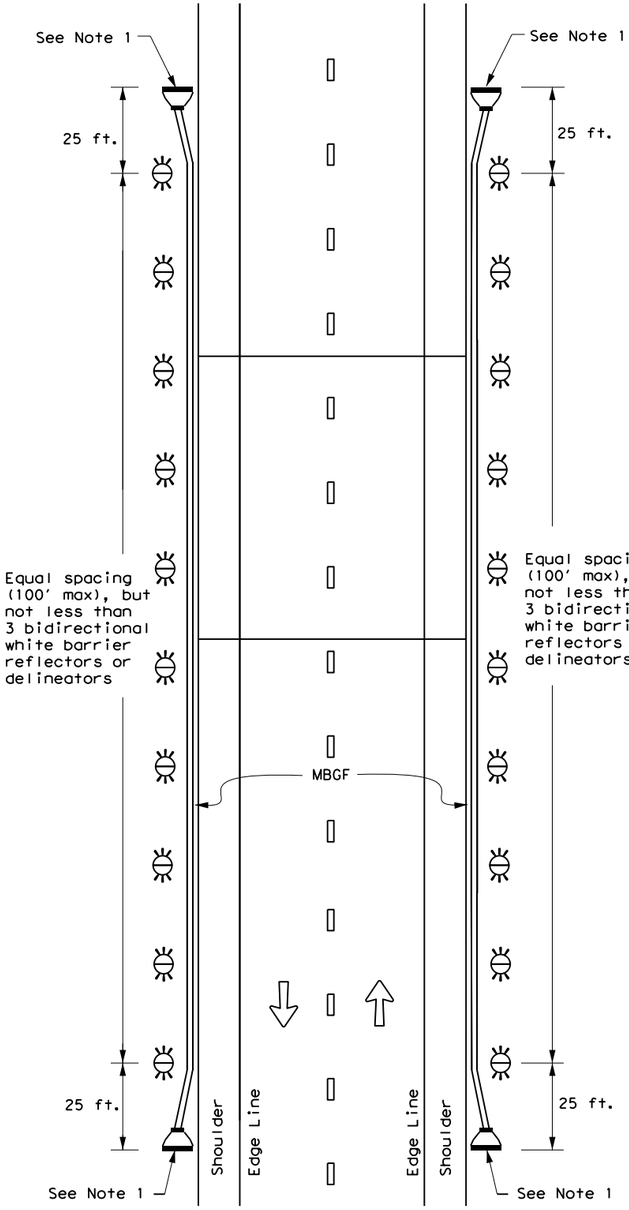
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

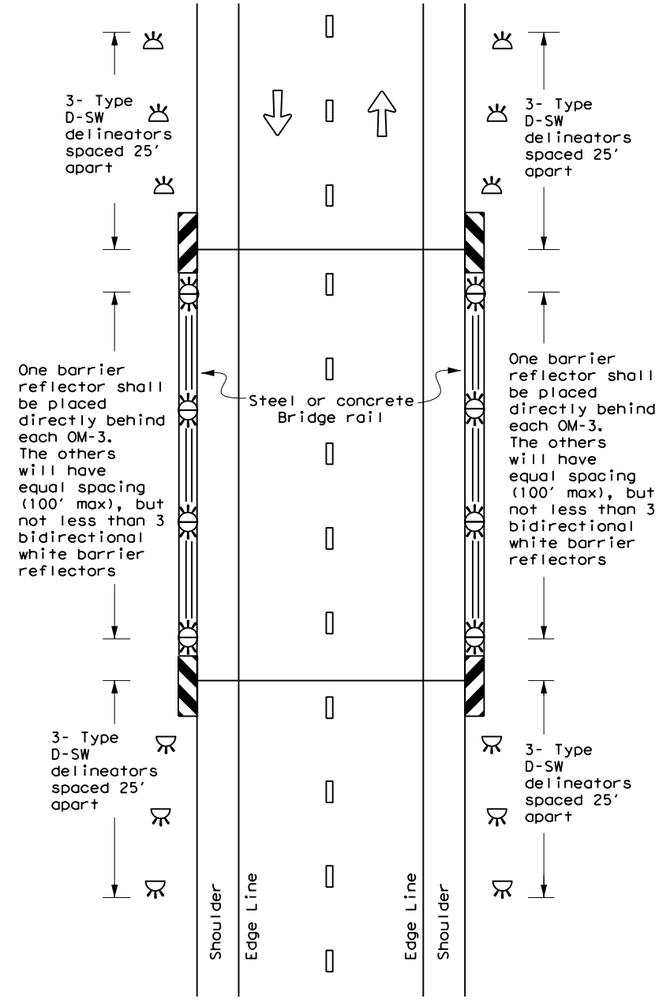
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
7-20	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		107

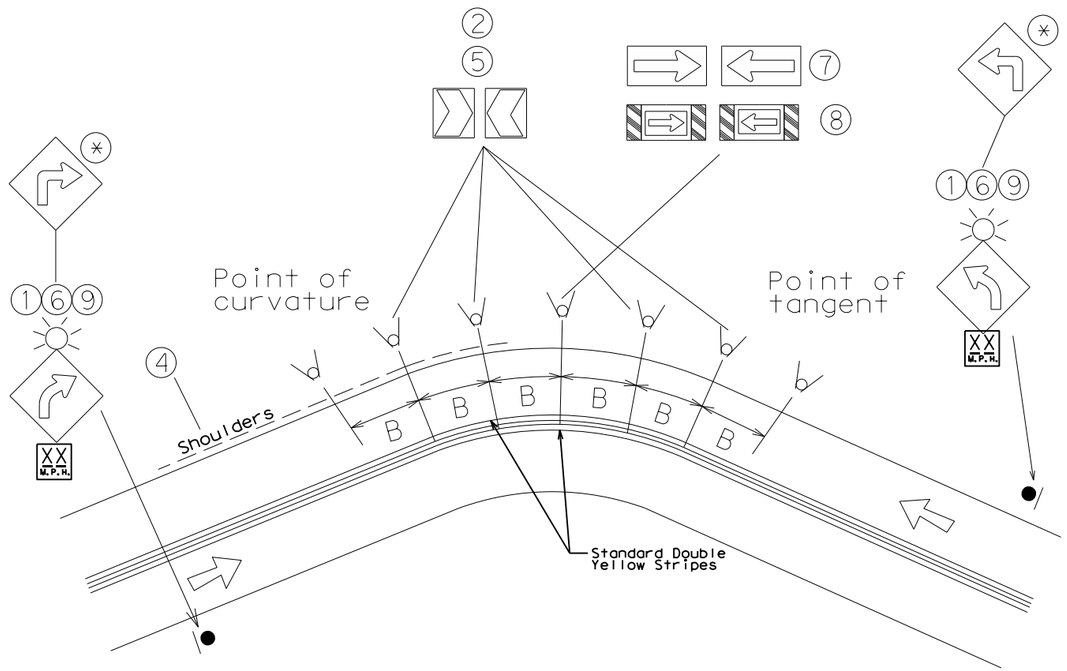
20E

DATE: $DATE$ $TIME$
FILE: $FILE$

$TIME$

$DATE$

Dallas District Standard for Two-Lane Highway Curve Signing/Markings



Curve Safety Sequence

Applicable Minimum Measures

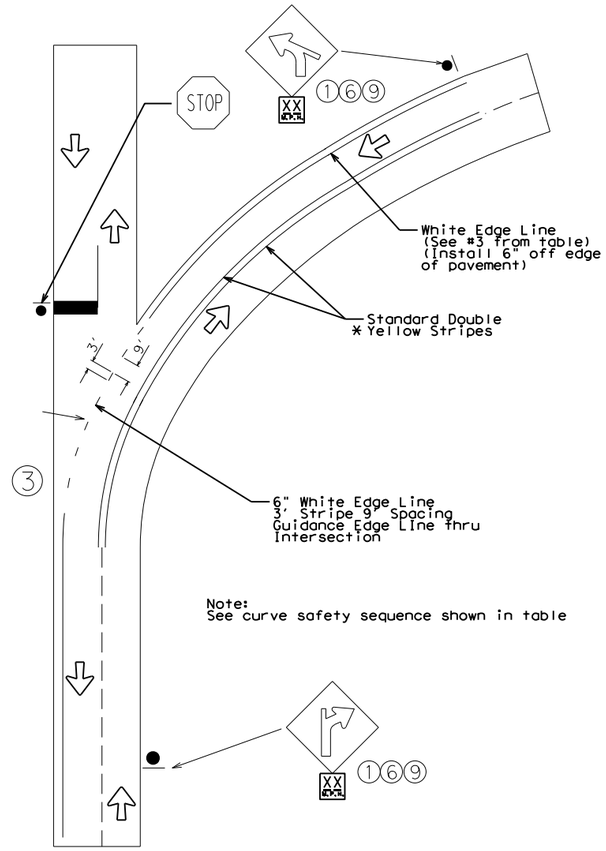
Advisory Speed 55 mph or higher	Advisory Speed 40-50 mph	Advisory speed 35 mph or less		Curve signing, delineation and pavement markings (listed in order from minimum to maximum level of treatment as needed)
+	+	+	1	Advance warning (36" x 36") and advisory mph (18" x 18")
+	+	+	2	Chevron alignment signs if advisory speed is 15 mph or greater than posted speed
	+	+	3	Edge lines
			3a	Pavement width 24' or greater 6" solid white edge line
			3b	Pavement width 20' - 24' 4" solid white edge line
			3c	Pavement width 20' or less no edge line
		Supplemental Measures		
		#	4	Add shoulders and edge line (see #3a)
		#	5	Yellow high intensity flourescent chevron alignment signs - add reflective sheeting to sign support from bottom edge of sign
#	#	#	6	Large advance warning (48" x 48") and advisory mph (30" x 30")
#	#	#	7	Arrow sign (48" x 24")
		#	8	Large arrow sign with diagonals (96" x 36")
		#	9	Add flashers to advance warning signs
#	#	#	10	Surface treatment to improve friction
			**	The W1-1R or L sign shall only be used when the advisory speed is
				30 mph or less

\+ = required
\# = optional

Applications 4 - 10 are additional supplemental applications which may be added as directed by the Area Engineer.

Note:
"B" - Chevron Spacing
referenced from D&OM(3)-15B

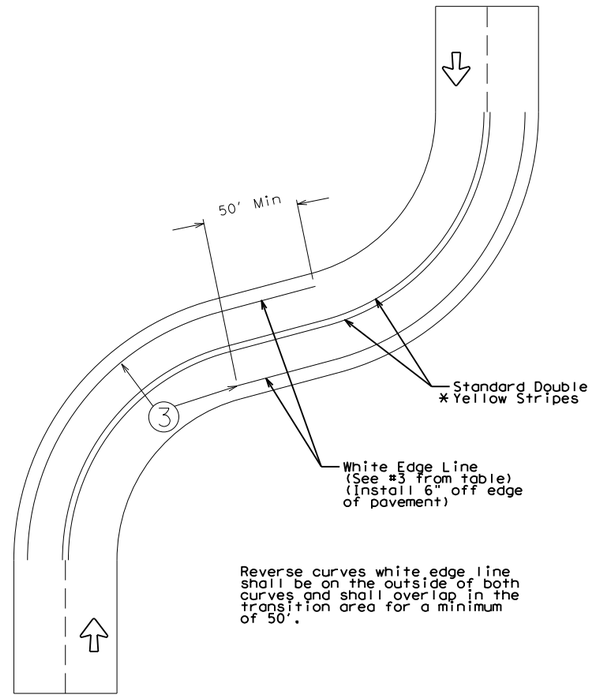
Typical Curve Treatment with Intersection



Note:
See curve safety sequence shown in table

* Standard Double Yellow Stripes shall be dropped through a non-signalized intersection within the city limit. Outside the city limit, the Standard Double Yellow Strip shall be carried through all non-signalized intersections.

Typical Reverse Curve Edge Line Treatment



Reverse curves white edge line shall be on the outside of both curves and shall overlap in the transition area for a minimum of 50'.

Notes:
1. Two methods will be used to determine the appropriate advisory speed for curves, the GPS Method(existing curves) and the Design Method (new curves).
2. Notify the Traffic Engineering Section for all requests on advisory speeds for existing curves.

OCT-2014 UPDATED NOTES
JAN-2016 NOTE ADDED
SEPT-2016 NOTE ADDED FOR STRIPING IN CURVE
MAR-2017 REMOVED REFERENCE TO DELINEATORS
MAY-2019 MODIFIED SIGN SIZE

Texas Department of Transportation

TWO-LANE HIGHWAY CURVE SIGNING & MARKINGS

DALLAS DISTRICT STANDARD

SCALE: NTS SHEET 1 OF 1

DESIGN/CK	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
BLS	6	SEE TITLE SHEET		FM 3356
CHECK BLS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK FRC	TEXAS	DALLAS	COLLIN	108
CHECK ARO	CONTROL	SECTION	JOB	
	3427	03	007	

$FILE$

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept in the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
3427-03-007 (FM 3356)

1.2 PROJECT LIMITS:

From: **FM 455**

To: **GRAYSON COUNTY LINE**

1.3 PROJECT COORDINATES:

BEGIN: (Lat) **33.4006781** ,(Long) **-96.6388928**

END: (Lat) **33.3618145** ,(Long) **-96.6362965**

1.4 TOTAL PROJECT AREA (Acres): **35.20**

1.5 TOTAL AREA TO BE DISTURBED (Acres): **25.48**

1.6 NATURE OF CONSTRUCTION ACTIVITY:
RESTORE EXISTING PAVEMENT AND ADD SHOULDERS

1.7 MAJOR SOIL TYPES:

Soil Type	Description
HOB, HOB2	HOUSTON BLACK CLAY
AID2, AIE3	ALTOGA SILTY CLAY
AuB, AuC2, AuD2	AUSTIN SILTY CLAY

The Vegetative Cover is in good condion with approximately 95% density.

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):

PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

- [x] PSLs determined during preconstruction meeting
- [ ] PSLs determined during construction
- [ ] No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

- [x] Mobilization
- [x] Install sediment and erosion controls
- [x] Blade existing topsoil into windrows, prep ROW, clear and grub
- [x] Remove existing pavement
- [x] Grading operations, excavation, and embankment
- [x] Excavate and prepare subgrade for proposed pavement widening
- [x] Remove existing culverts, safety end treatments (SETs)
- [ ] Remove existing metal beam guard fence (MBGF), bridge rail
- [x] Install proposed pavement per plans
- [x] Install culverts, culvert extensions, SETs
- [ ] Install mow strip, MBGF, bridge rail
- [x] Place flex base
- [x] Rework slopes, grade ditches
- [x] Blade windrowed material back across slopes
- [x] Revegetation of unpaved areas
- [x] Achieve site stabilization and remove sediment and erosion control measures
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

- [x] Sediment laden stormwater from stormwater conveyance over disturbed area
- [x] Fuels, oils, and lubricants from construction vehicles, equipment, and storage
- [x] Solvents, paints, adhesives, etc. from various construction activities
- [x] Transported soils from offsite vehicle tracking
- [x] Construction debris and waste from various construction activities
- [ ] Contaminated water from excavation or dewatering pump-out water
- [x] Sanitary waste from onsite restroom facilities
- [x] Trash from various construction activities/receptacles
- [x] Long-term stockpiles of material and waste
- [x] Other: Concrete Pouring
- [x] Other: Concrete Washout
- [ ] Other: _____

1.11 RECEIVING WATERS:

Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
DRAINAGE TO WHITE'S CREEK, EAST FORK TRINITY RIVER 19, AND EAST FORK TRINITY RIVER	EAST FORK TRINITY RIVER "ABOVE LAKE LAVON (0821D); IMPAIRED BY BACTERIA IN WATER (RECREATION USE)"

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

- [x] Development of plans and specifications
- [x] Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- [x] Post Construction Site Notice
- [x] Submit NOI/CSN to local MS4
- [x] Perform SWP3 inspections
- [x] Maintain SWP3 records and update to reflect daily operations
- [x] Complete and submit Notice of Termination to TCEQ
- [x] Maintain SWP3 records for 3 years
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

- [x] Day To Day Operational Control
- [x] Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- [x] Post Construction Site Notice
- [x] Submit NOI/CSN to local MS4
- [x] Maintain schedule of major construction activities
- [x] Install, maintain and modify BMPs
- [x] Complete and submit Notice of Termination to TCEQ
- [x] Maintain SWP3 records for 3 years
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity
COLLIN COUNTY PHASE II MS4 CONTACT TRACY HAMFIELD

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED PROFESSIONAL ENGINEER

02/28/2023

STORMWATER POLLUTION PREVENTION PLAN (SW3P)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		109
STATE	STATE DIST.	COUNTY	
TEXAS	DALLAS	COLLIN	
CONT.	SECT.	JOB	HIGHWAY NO.
3427	03	007	FM 3356

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- [X] [ ] Protection of Existing Vegetation
- [ ] [ ] Vegetated Buffer Zones
- [ ] [ ] Soil Retention Blankets
- [ ] [ ] Geotextiles
- [ ] [ ] Mulching/ Hydromulching
- [ ] [ ] Soil Surface Treatments
- [X] [ ] Temporary Seeding
- [ ] [X] Permanent Planting, Sodding or Seeding
- [X] [ ] Biodegradable Erosion Control Logs
- [X] [ ] Rock Filter Dams/ Rock Check Dams
- [X] [ ] Vertical Tracking
- [ ] [ ] Interceptor Swale
- [ ] [X] Riprap
- [ ] [ ] Diversion Dike
- [ ] [ ] Temporary Pipe Slope Drain
- [ ] [X] Embankment for Erosion Control
- [ ] [ ] Paved Flumes
- [ ] [ ] Other: _____
- [ ] [ ] Other: _____
- [ ] [ ] Other: _____
- [ ] [ ] Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- [X] [ ] Biodegradable Erosion Control Logs
- [ ] [ ] Dewatering Controls
- [ ] [ ] Inlet Protection
- [X] [ ] Rock Filter Dams/ Rock Check Dams
- [ ] [ ] Sandbag Berms
- [X] [ ] Sediment Control Fence
- [X] [ ] Stabilized Construction Exit
- [ ] [ ] Floating Turbidity Barrier
- [ ] [ ] Vegetated Buffer Zones
- [ ] [ ] Vegetated Filter Strips
- [ ] [ ] Other: _____
- [ ] [ ] Other: _____
- [ ] [ ] Other: _____
- [ ] [ ] Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

T / P

- [ ] [ ] Sediment Trap
  - [ ] Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - [ ] 3,600 cubic feet of storage per acre drained
- [ ] [ ] Sedimentation Basin
  - [ ] Not required (<10 acres disturbed)
  - [ ] Required (>10 acres) and implemented.
    - [ ] Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - [ ] 3,600 cubic feet of storage per acre drained
  - [X] Required (>10 acres), but not feasible due to:
    - [X] Available area/Site geometry
    - [ ] Site slope/Drainage patterns
    - [ ] Site soils/Geotechnical factors
    - [ ] Public safety
    - [X] Other: **Alternate BMP's are provided in SW3P for equivalent sedimentation control.**

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To
No pemanent controls are planned.		

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- [X] Excess dirt/mud on road removed daily
- [ ] Haul roads dampened for dust control
- [X] Loaded haul trucks to be covered with tarpaulin
- [X] Stabilized construction exit
- [X] Other: **Site dampened for dust control**
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- [X] Chemical Management
- [X] Concrete and Materials Waste Management
- [X] Debris and Trash Management
- [X] Dust Control
- [ ] Sanitary Facilities
- [X] Other: Avoid storing portable sanitary units, concrete washouts or chemicals within 50 feet upgradient of a receiving water or drainage conveyance without adequate pollution controls.
- [X] Other: Capture saw-cutting debris and slurry for proper disposal.
- [X] Other: Maintain roadways, active pedestrian facilities and adjacent properties free of project sedimentation and loose materials.
- [ ] Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

According to USGS, intermittent Tributary 19 to East Fork Trinity River crosses the project area at Culvert 8, STA 83+98.64. No discernible surface water is present. Due to required culvert modifications, disturbance of the vegatative buffer is unavoidable. Alternate controls including rock filter dams and silt fences shall used to protect water quality.

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- [X] Fire hydrant flushings
- [X] Irrigation drainage
- [X] Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- [X] Potable water sources
- [X] Springs
- [X] Uncontaminated groundwater
- [X] Water used to wash vehicles or control dust
- [X] Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3 .

2.9 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED PROFESSIONAL ENGINEER

02/28/2023

STORMWATER POLLUTION PREVENTION PLAN (SW3P)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		109A
STATE	STATE DIST.	COUNTY	
TEXAS	DALLAS	COLLIN	
CONT.	SECT.	JOB	HIGHWAY NO.
3427	03	007	FM 3356

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damage resulting from its use.

Notes To Designer:
1. Do not alter Sheet Design or Font style, size or weight - match text attributes.
2. If additional space is needed for a numbered section, fence and adjust sections up or down as needed for proportioning and readability but do not relocate from its relative position.
3. All areas should be addressed thoroughly and verify the necessary pay items are set up to support actions needed.

Filled Out: XX/XX/XXXX
Prepared by: Name/Section

I. STORMWATER POLLUTION PREVENTION PLAN-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.
List adjacent MS 4 Operator(s) that receive discharges from this project. They need to be notified prior to construction activities.
(Note: Leave blank only if no adjacent MS 4 Operator(s) are affected.)

1. Collin County Phase II MS4 Contact Tracy Homfeld

2.

☐ No Action Required ☒ Required Action

Action Number:

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000.
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas. No equipment is allowed in any sream channel below the ordinary High Water Mark except on approved temporary stream crossings or drill pads.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☒ No Permit Required
☐ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
☐ Individual 404 Permit Required
☐ Other Nationwide Permit Required: NWP# 3(a)

Required Actions: List Waters of the US Permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.
1.

2.

3.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices for applicable 401 General Conditions:
(Note: If CORP Permit not required, do not check boxes.)

Erosion	Sedimentation	Post-Construction TSS
☐ Temporary Vegetation	☐ Silt Fence	☐ Vegetative Filter Strips
☐ Blankets/Matting	☐ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☐ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action Number:

1.

2.

3.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751 & 752 in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal commitments.

☒ No Action Required ☐ Required Action

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS TREATY ACT.

☐ No Action Required ☒ Required Action

Action Number:

1. The following species could occur in the project area: Woodhouse's toad, Western Burrowing Owl, eastern spotted skunk, long-tailed weasel, and Texas garter snake. Follow the special notes on the EPIC sheet and the BMPs listed below to protect these species.

2. Contractor to implementthe following BMPs from "Beneficial Management Practices: Avoiding,Minimizing, and Mitigating Impacts of Transportation Projects on State Natural Resoruces" available at https://ftp.txdot.gov/pub/txdot-info/env/toolkit/300-01-bmp.pdf.
   a. Section 2.6.1 Aquatic Amphibian and Reptile BMP (barrier fencing not required)
   b. Section 2.6.2 Terrestrial Amphibian and Reptile BMP
   c. Section 2.2.1 Bird BMP
   d. Section 1.4 Water Quality BMP
   e. Section 1.2 BMP

Special Notes:

1. Avoid harming all wildlife species if encountered and allow them to safely leave the project site. Due diligence should be used to avoid killing or harming any wildlife species in the implementation of transportation projects.

2. If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediated area, and contact the Engineer immediately.

3. The Migratory Bird Act of 1918 states that it is unlawful to kill, capture, collect, possess, buy, sell, trade or transport any migratory bird, nest, young, feather or egg in part or in whole, without a federal permit issued in accordance within the Act's policies and regulations. The contractor would remove all old migratory bird nests from any structure or trees where work would be done from October 1 to February 15. In addition, the contractor would be prepared to prevent migratory birds from building nest(s) between February 15 to October 1. In the event that migratory birds are encountered on-site during project construction, efforts to avoid adverse impacts on protected birds, active nests, eggs and/or young would be observed.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corp of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):
Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Safety Data Sheets (SDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act. Maintain an adequate supply of on-site spill response materials, as indicated in the SDS. In the event of a spill, take actions to mitigate the spill as indicated in the SDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canisters, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation(s) or replacement(s) (bridge class structures not including box culverts)?
☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?
☐ Yes ☐ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action Number:

1.

2.

3.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action Number:

1.

GENERAL NOTE:

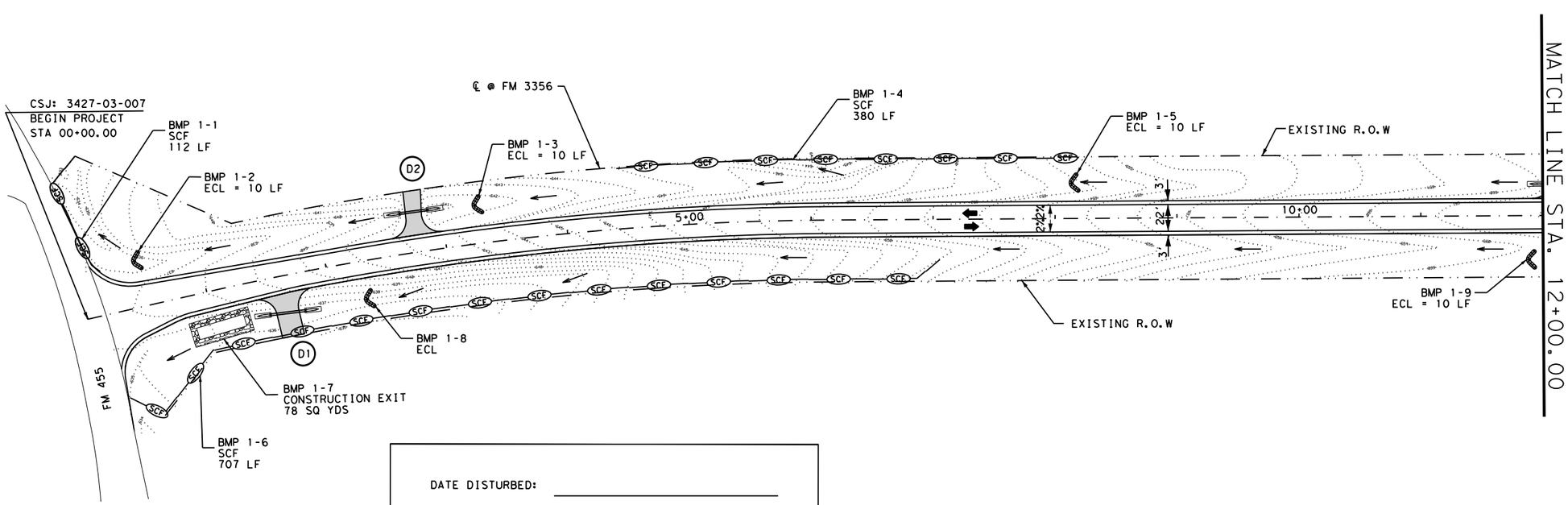
Any change orders and/or deviations from the final design must be reported to the Engineer prior to commencement of construction activities, as additional environmental clearance may be required.

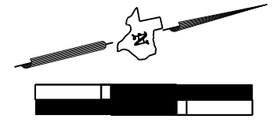
LAST REVISION: 1/15/15

 Texas Department of Transportation
Dallas District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

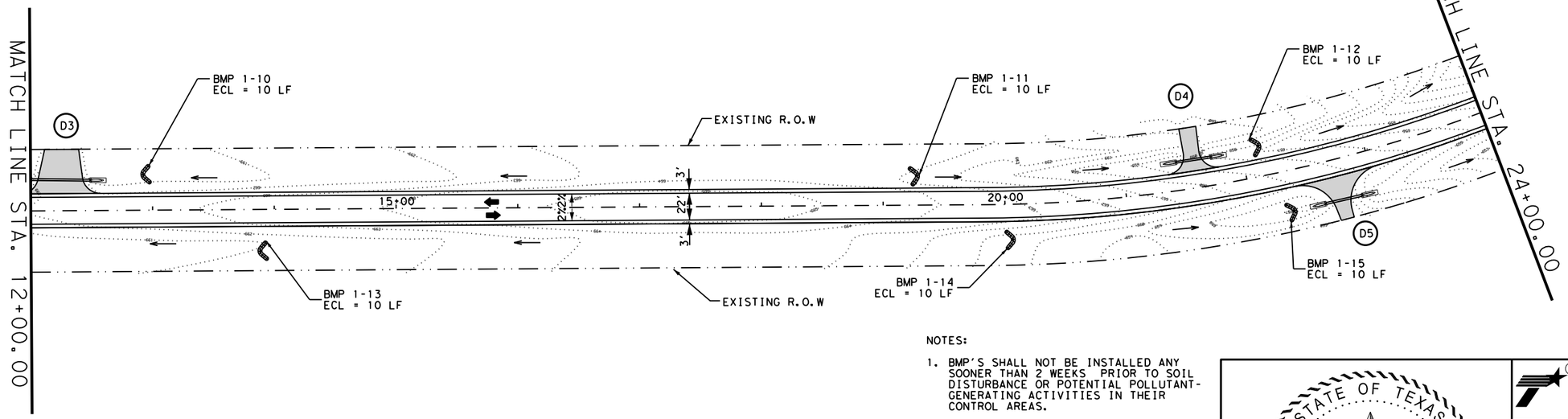
FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 3356
STATE	DISTRICT	COUNTY	
TEXAS	DALLAS	Collin	
CONTROL	SECTION	JOB	SHEET NO.
3427	03	007	110

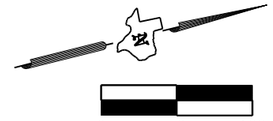




DATE DISTURBED: _____

DATE STABILIZED: _____





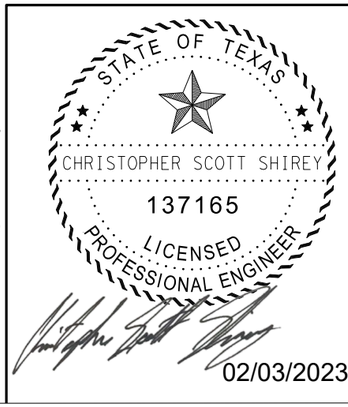
LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM
- SCF — SILT FENCE

	DATE INSTALLED	DATE REMOVED
BMP 1-1		
BMP 1-2		
BMP 1-3		
BMP 1-4		
BMP 1-5		
BMP 1-6		
BMP 1-7		
BMP 1-8		
BMP 1-9		
BMP 1-10		
BMP 1-11		
BMP 1-12		
BMP 1-13		
BMP 1-14		
BMP 1-15		

NOTES:

1. BMP'S SHALL NOT BE INSTALLED ANY SOONER THAN 2 WEEKS PRIOR TO SOIL DISTURBANCE OR POTENTIAL POLLUTANT-GENERATING ACTIVITIES IN THEIR CONTROL AREAS.
2. 10 LF OF EROSION CONTROL LOG TO BE PLACED IN THE DITCH ON BOTH SIDES OF THE ROAD APPROXIMATELY EVERY 500', THE BEGINNING AND END OF PROJECT, AND ON EACH CORNER OF THE INTERSECTION. ACTUAL LOCATIONS OF THE EROSION CONTROL LOG MAY BE ADJUSTED WITH ENGINEER APPROVAL.
3. CONSTRUCTION EXIT LOCATIONS TO BE DETERMINED BY CONTRACTOR AND APPROVED BY THE ENGINEER.
4. SEE DAILY WORK REPORTS FOR INITIAL STABILIZATION TIME FRAMES.
5. SEE TYPICAL SECTIONS FOR THE DISTURBANCE AND SEEDING LIMITS.
6. MINIMIMIZE UNNECESSARY DISTURBANCE OF EXISTING TREES AND VEGETATION OUTSIDE OF THE MUTCD "CLEAR ZONE" TO THE EXTENT POSSIBLE.



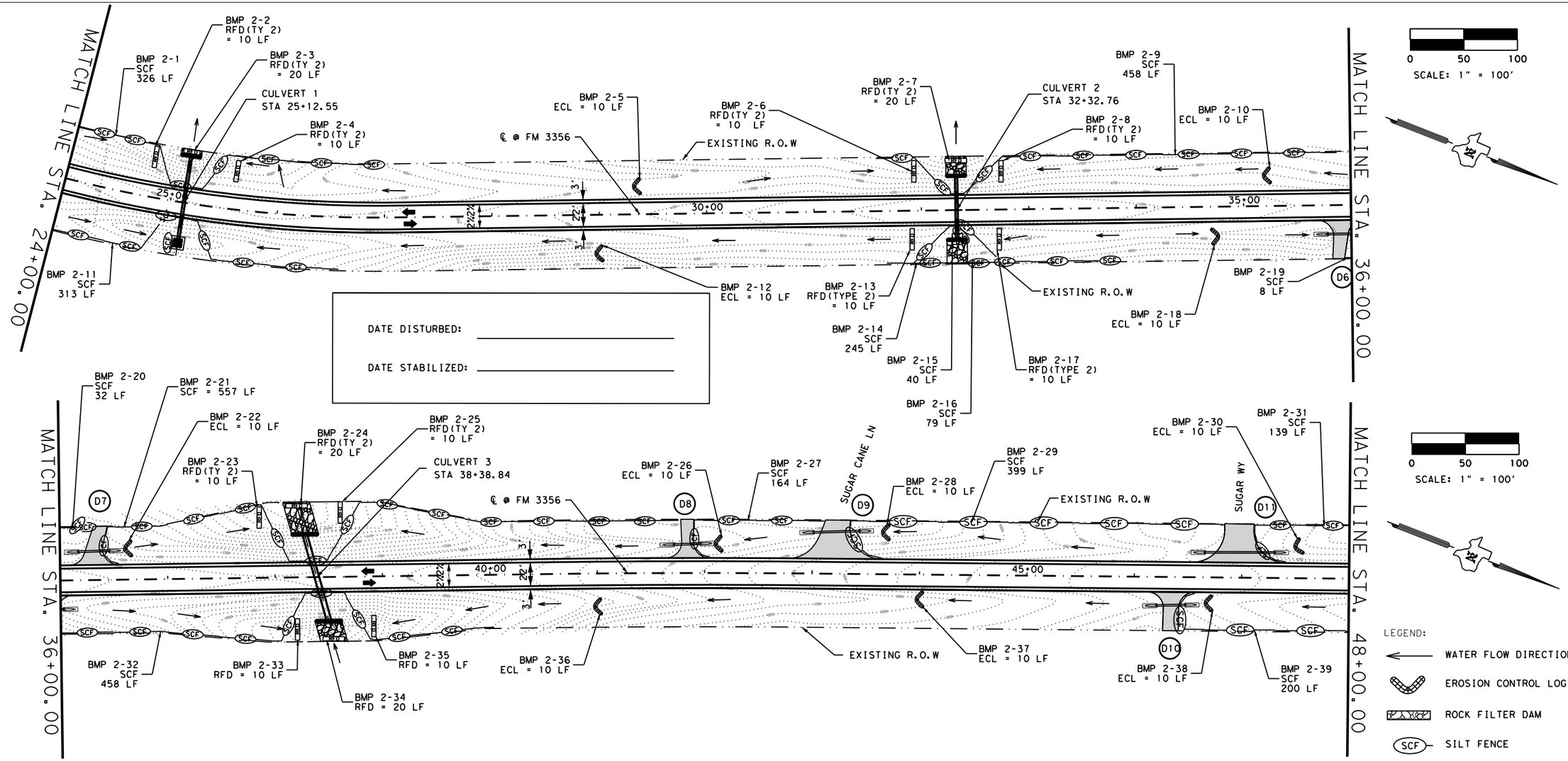
Texas Department of Transportation

FM 3356
SW3P SITE MAP
STA 0+00 TO 24+00

SHEET 1 OF 7

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CS	TEXAS	DALLAS	COLLIN	
CHECK	CONTROL	SECTION	JOB	
MS	3427	03	007	111
CHECK				
JRV				

$USER$
$TIME$
$DATE$
DATE TIME
DOCUMENT NAME
$FILE$
$PLTDRV$
PEN



DATE DISTURBED: _____

DATE STABILIZED: _____

POND

	DATE INSTALLED	DATE REMOVED
BMP 2-1		
BMP 2-2		
BMP 2-3		
BMP 2-4		
BMP 2-5		
BMP 2-6		
BMP 2-7		
BMP 2-8		
BMP 2-9		
BMP 2-10		
BMP 2-11		
BMP 2-12		
BMP 2-13		
BMP 2-14		
BMP 2-15		
BMP 2-16		
BMP 2-17		
BMP 2-18		
BMP 2-19		
BMP 2-20		
BMP 2-21		
BMP 2-22		
BMP 2-23		

	DATE INSTALLED	DATE REMOVED
BMP 2-24		
BMP 2-25		
BMP 2-26		
BMP 2-27		
BMP 2-28		
BMP 2-29		
BMP 2-30		
BMP 2-31		
BMP 2-32		
BMP 2-33		
BMP 2-34		
BMP 2-35		
BMP 2-36		
BMP 2-37		
BMP 2-38		
BMP 2-39		

NOTES:

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4. SEE DAILY WORK REPORTS FOR INITIAL STABILIZATION TIME FRAMES.
5. SEE TYPICAL SECTIONS FOR THE DISTURBANCE AND SEEDING LIMITS.
6. MINIMIMIZE UNNECESSARY DISTURBANCE OF EXISTING TREES AND VEGETATION OUTSIDE OF THE MUTCD "CLEAR ZONE" TO THE EXTENT POSSIBLE.

STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

FM 3356
SW3P SITE MAP
FM 24+00 TO 48+00

SHEET 2 OF 7

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS: CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK: MS	TEXAS	DALLAS	COLLIN	
CHECK: JRV	CONTROL	SECTION	JOB	112
	3427	03	007	

NOTES:

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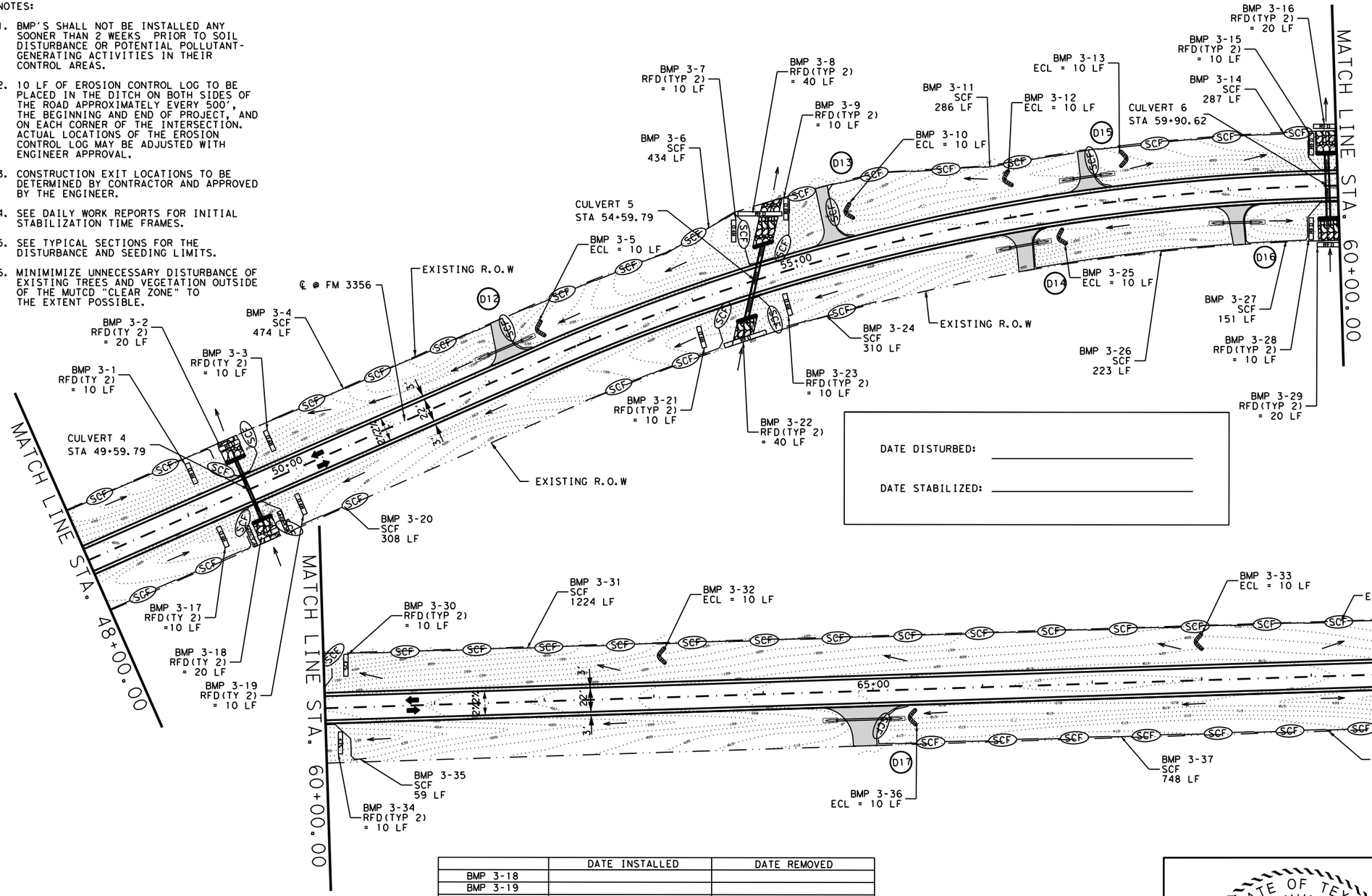
5. SEE TYPICAL SECTIONS FOR THE DISTURBANCE AND SEEDING LIMITS.
6. MINIMIMIZE UNNECESSARY DISTURBANCE OF EXISTING TREES AND VEGETATION OUTSIDE OF THE MUTCD "CLEAR ZONE" TO THE EXTENT POSSIBLE.



DATE DISTURBED: _____

DATE STABILIZED: _____

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BMP 3-17		

	DATE INSTALLED	DATE REMOVED
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BMP 3-35		
BMP 3-36		
BMP 3-37		
BMP 3-38		

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM
- SCF — SILT FENCE

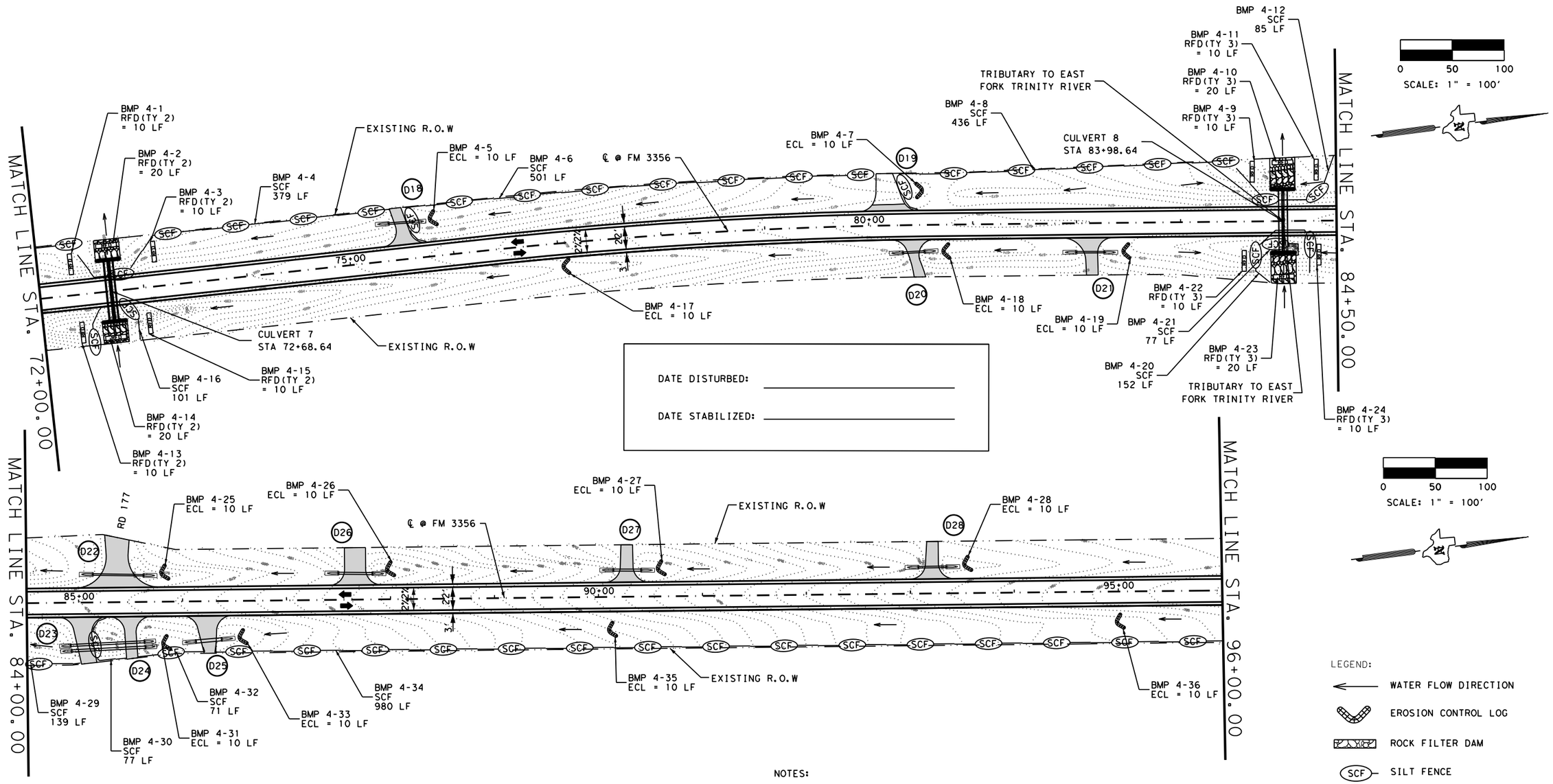
STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

FM 3356
SW3P SITE MAP
STA 48+00 TO 72+00

SHEET 3 OF 7

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	113
	3427	03	007	



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	DATE INSTALLED	DATE REMOVED
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BMP 4-35		
BMP 4-36		

NOTES:

1. BMP'S SHALL NOT BE INSTALLED ANY SOONER THAN 2 WEEKS PRIOR TO SOIL DISTURBANCE OR POTENTIAL POLLUTANT-GENERATING ACTIVITIES IN THEIR CONTROL AREAS.
2. 10 LF OF EROSION CONTROL LOG TO BE PLACED IN THE DITCH ON BOTH SIDES OF THE ROAD APPROXIMATELY EVERY 500', THE BEGINNING AND END OF PROJECT, AND ON EACH CORNER OF THE INTERSECTION. ACTUAL LOCATIONS OF THE EROSION CONTROL LOG MAY BE ADJUSTED WITH ENGINEER APPROVAL.
3. CONSTRUCTION EXIT LOCATIONS TO BE DETERMINED BY CONTRACTOR AND APPROVED BY THE ENGINEER.
4. SEE DAILY WORK REPORTS FOR INITIAL STABILIZATION TIME FRAMES.
5. SEE TYPICAL SECTIONS FOR THE DISTURBANCE AND SEEDING LIMITS.
6. MINIMIMIZE UNNECESSARY DISTURBANCE OF EXISTING TREES AND VEGETATION OUTSIDE OF THE MUTCD "CLEAR ZONE" TO THE EXTENT POSSIBLE.

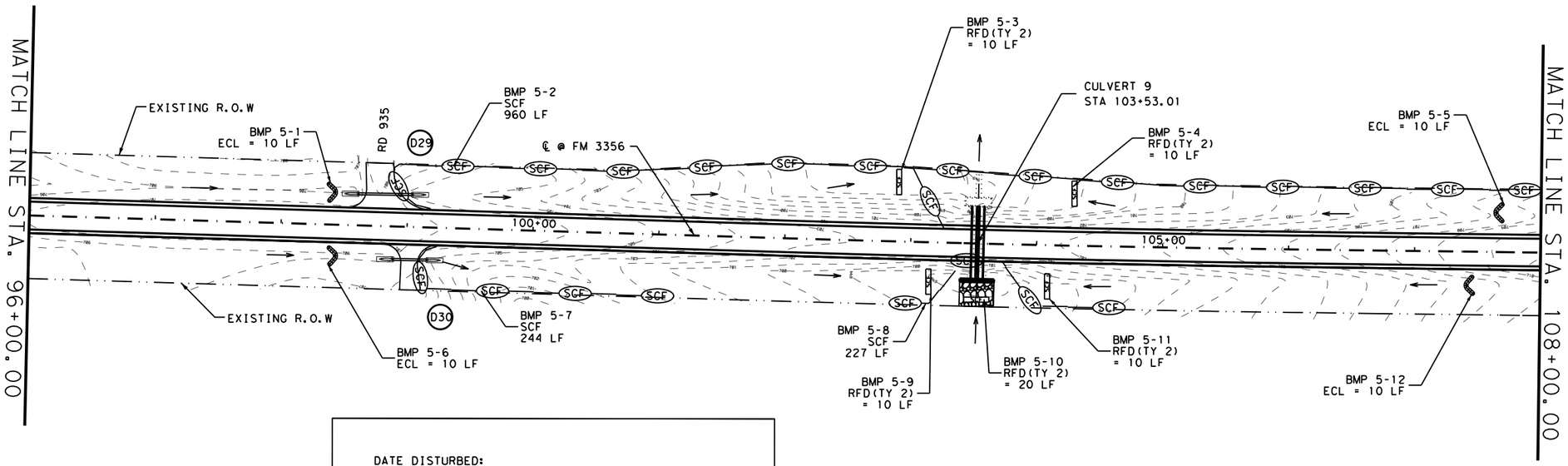
STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

Texas Department of Transportation

FM 3356
SW3P SITE MAP
STA 72+00 TO 96+00

SHEET 4 OF 7

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CS	TEXAS	DALLAS	COLLIN	
CHECK	CONTROL	SECTION	JOB	
MS	3427	03	007	114
CHECK				
JRV				



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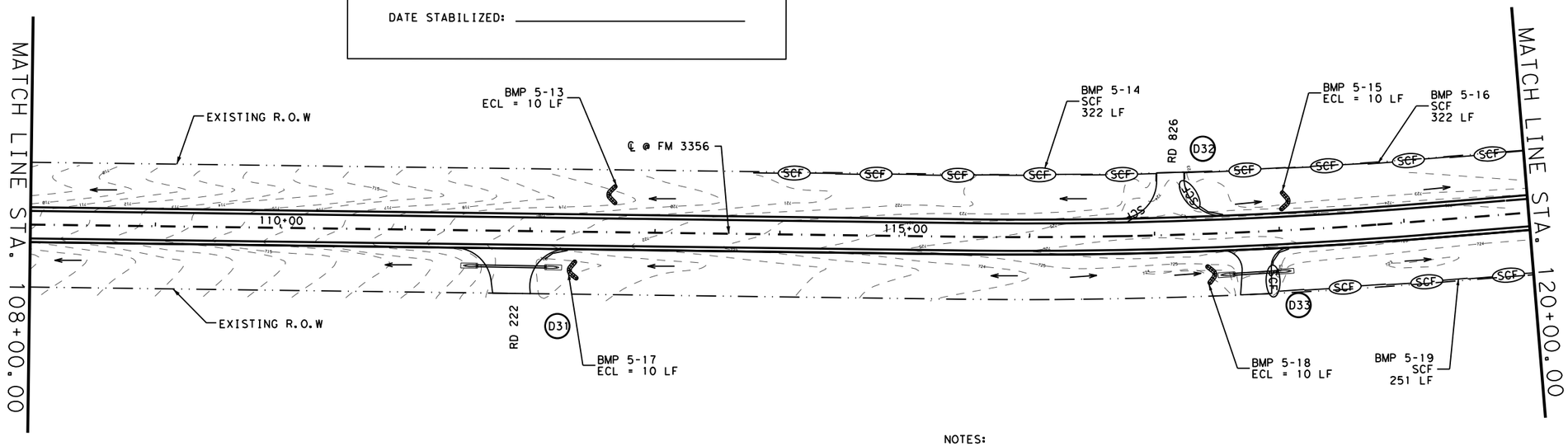
SCALE: 1" = 100'

DATE DISTURBED: _____

DATE STABILIZED: _____



0 50 100
SCALE: 1" = 100'

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TYPE 2)
- SCF — SILT FENCE

	DATE INSTALLED	DATE REMOVED
BMP 5-1		
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BMP 5-18		
BMP 5-19		

NOTES:

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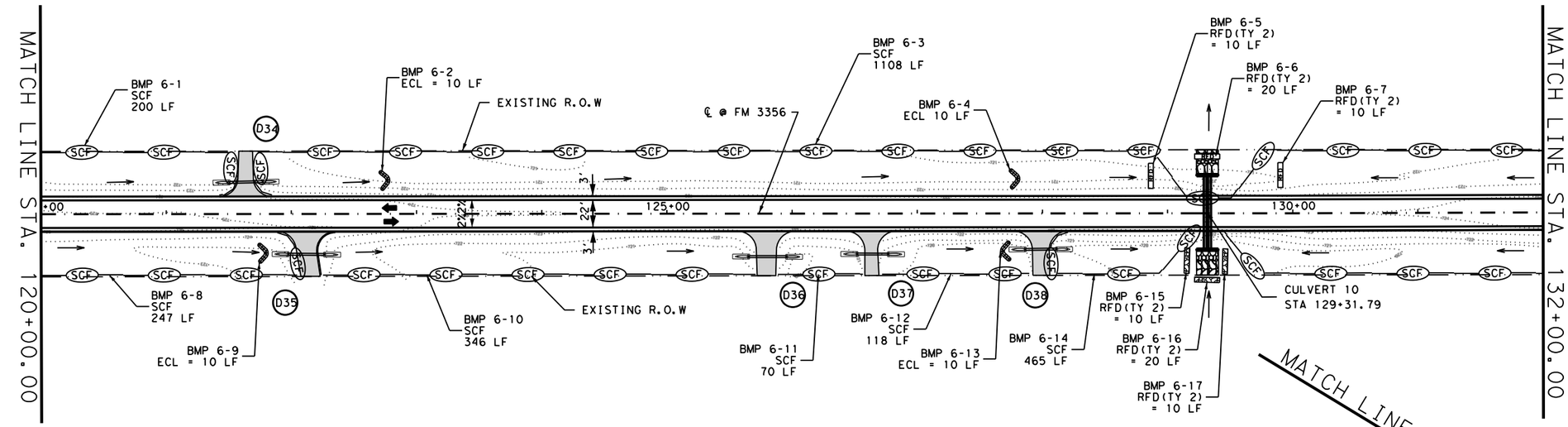
STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

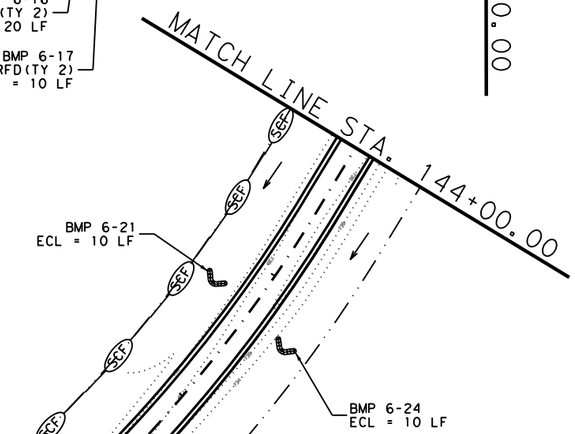
Texas Department of Transportation

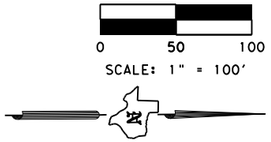
FM 3356
SW3P SITE MAP
STA 96+00 TO 120+00

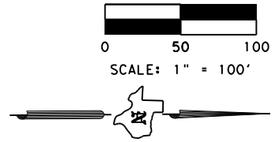
SHEET 5 OF 7

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DALLAS	COLLIN	
CHECK JRV	CONTROL	SECTION	JOB	115
	3427	03	007	









NOTES:

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	DATE INSTALLED	DATE REMOVED
BMP 6-1		
BMP 6-2		
BMP 6-3		
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BMP 6-7		
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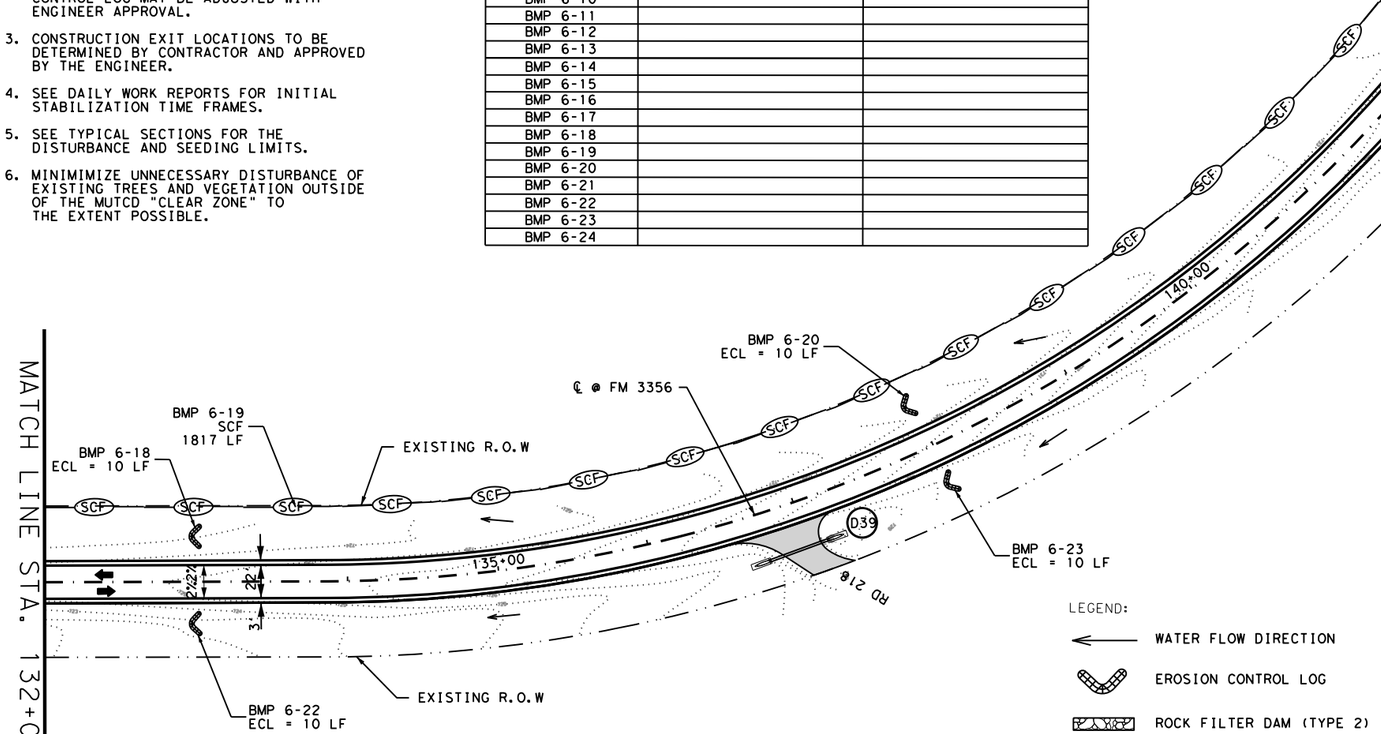


LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TYPE 2)
- SCF — SILT FENCE

DATE DISTURBED: _____

DATE STABILIZED: _____

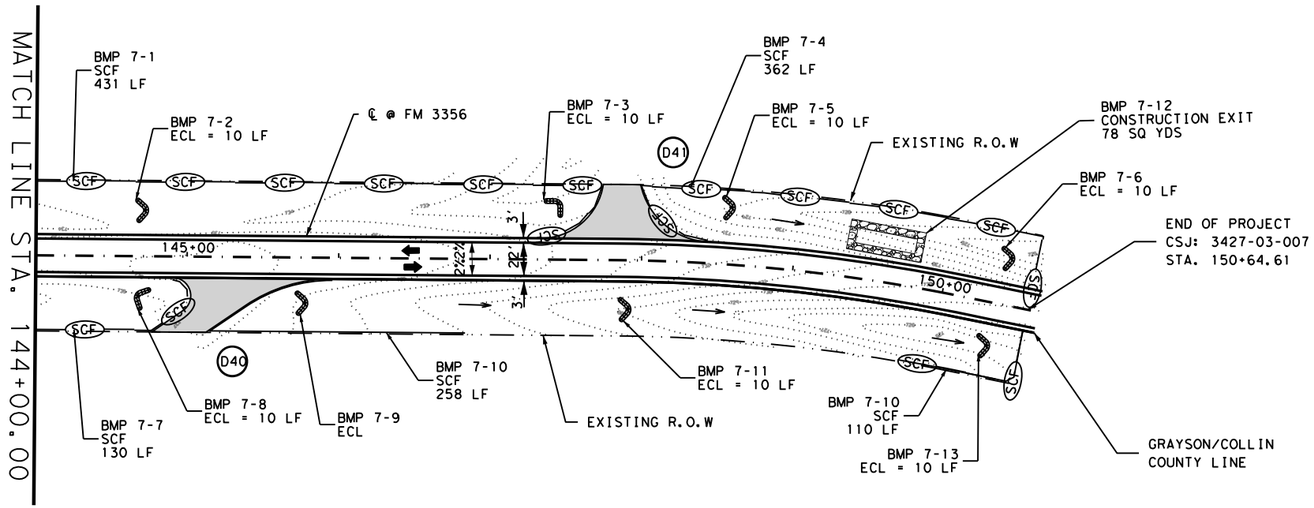
STATE OF TEXAS
CHRISTOPHER SCOTT SHIREY
137165
LICENSED
PROFESSIONAL ENGINEER
02/03/2023

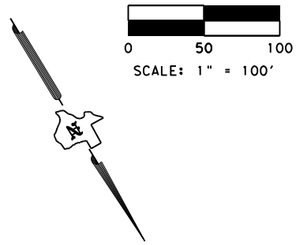
Texas Department of Transportation

FM 3356
SW3P SITE MAP
STA 120+00 TO 144+00

SHEET 6 OF 7

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS: CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK: MS	TEXAS	DALLAS	COLLIN	
CHECK: JRV	CONTROL	SECTION	JOB	116
	3427	03	007	





	DATE INSTALLED	DATE REMOVED
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BMP 7-3		
BMP 7-4		
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BMP 7-10		
BMP 7-11		
BMP 7-12		
BMP 7-13		

DATE DISTURBED: _____

DATE STABILIZED: _____

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TYPE 2)
- SCF — SILT FENCE

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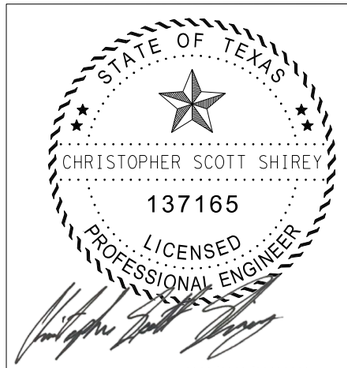


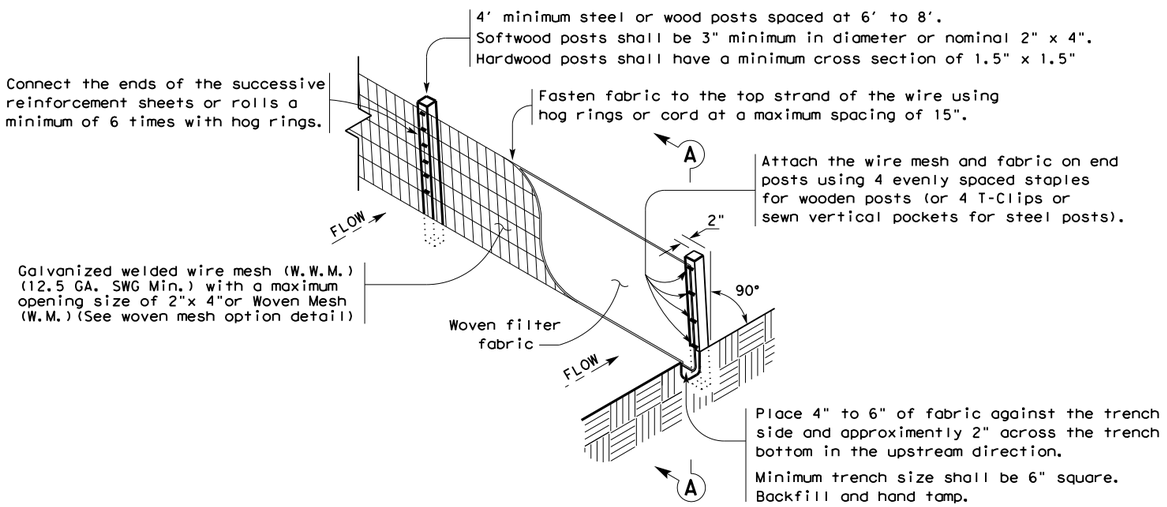
Texas Department of Transportation

FM 3356

STA 144+00 TO 150+64.61

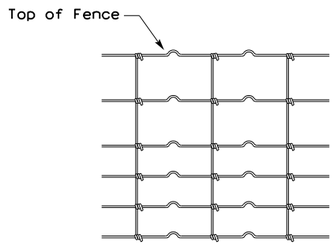
SHEET 7 OF 7

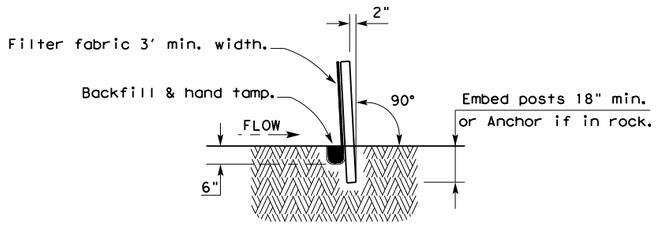
DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
CS	6	SEE TITLE SHEET		FM 3356
GRAPHICS: CS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK: MS	TEXAS	DALLAS	COLLIN	
CHECK: JRV	CONTROL	SECTION	JOB	117
	3427	03	007	



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

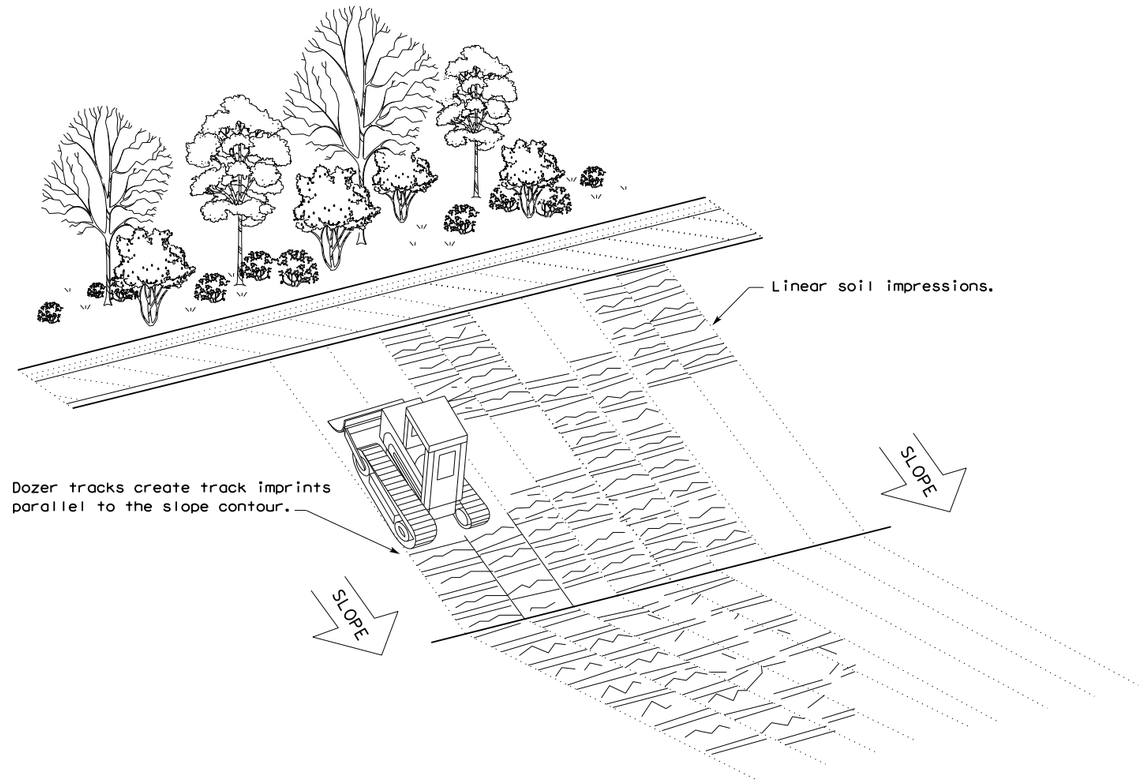
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

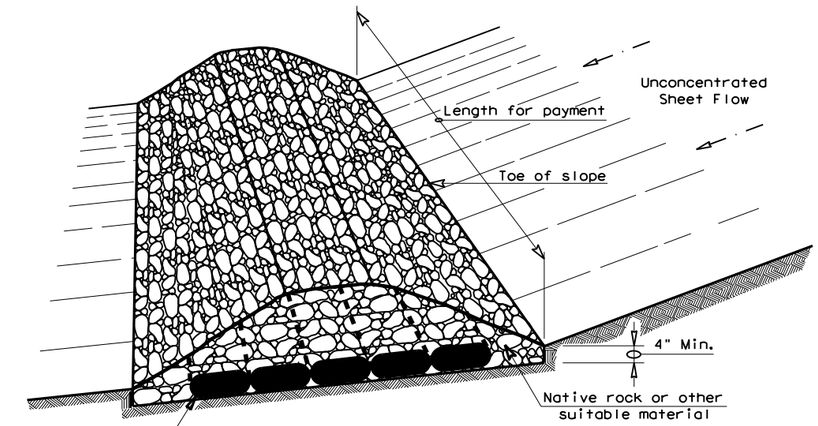
FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT		CK: KM		DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	3427	03	007		FM 3356	
	DIST	COUNTY			SHEET NO.	
	DAL	COLLIN			118	

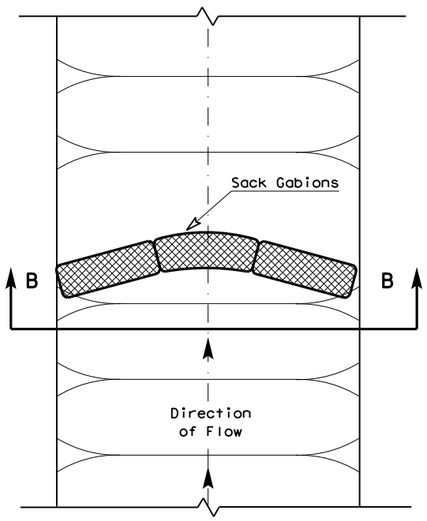
$DATE$
$FILE$

DATE: $DATE$
FILE: $FILE$

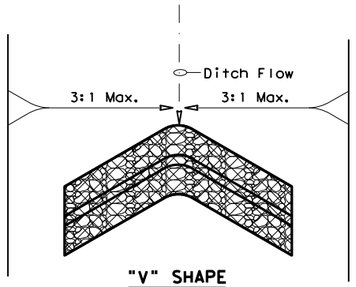


FILTER DAM AT TOE OF SLOPE

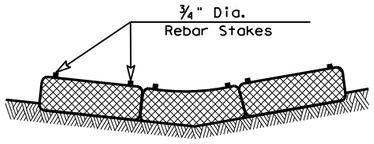
RFD1



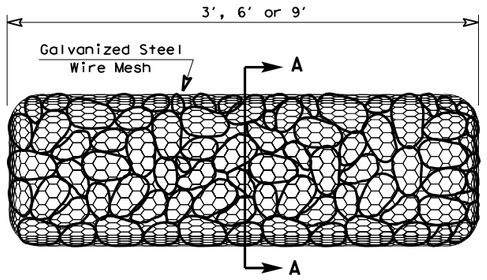
PLAN VIEW



"V" SHAPE PLAN VIEW

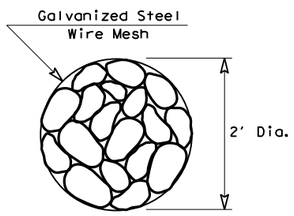


SECTION B-B

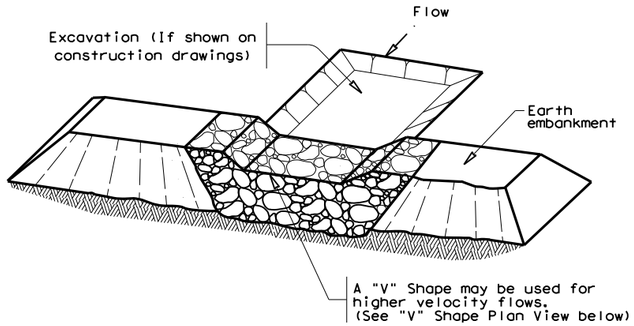


TYPE 4 (SACK GABIONS)

RFD4

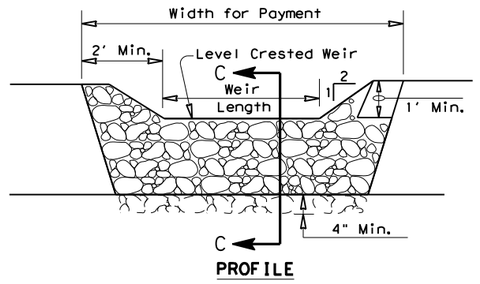


SECTION A-A

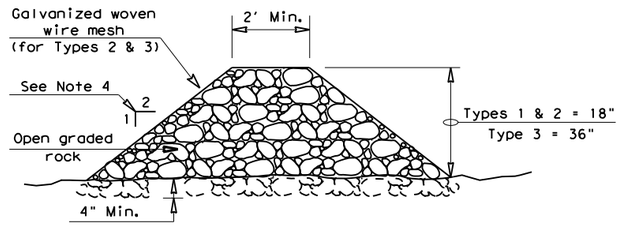


FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2



PROFILE



SECTION C-C

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

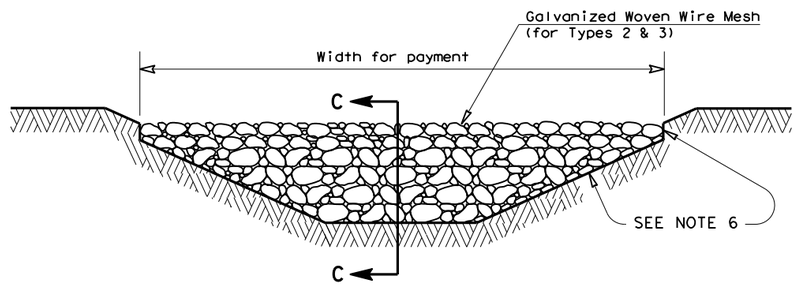
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation — Design Division Standard

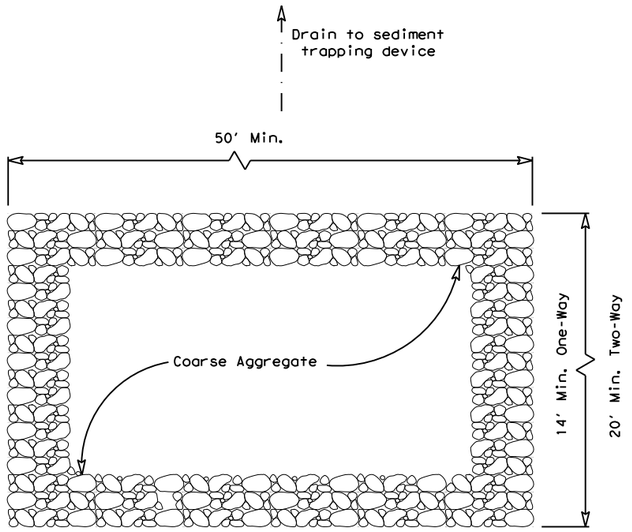
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

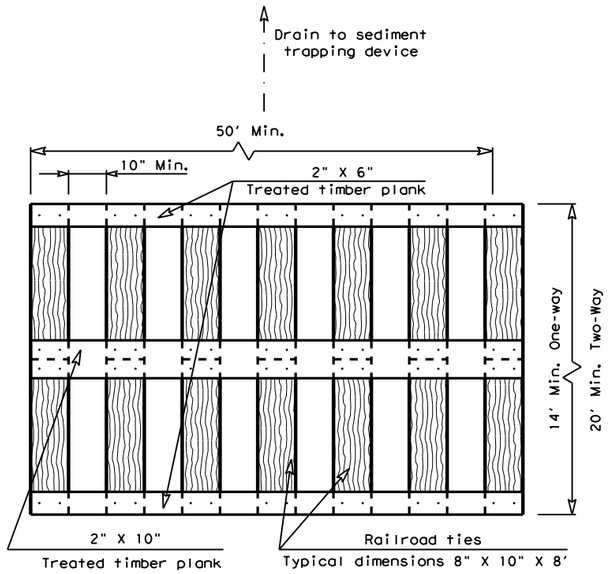
EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		119

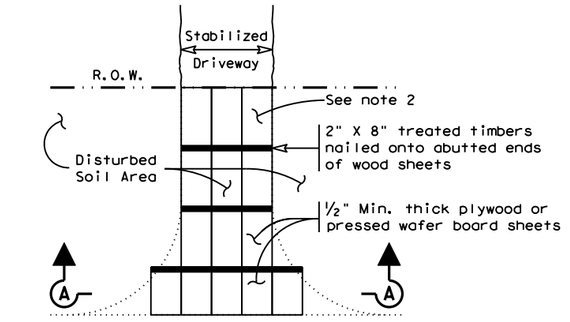
DATE: $DATE$
FILE: $FILE$



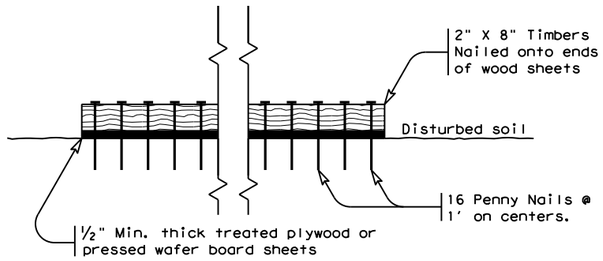
PLAN VIEW



PLAN VIEW



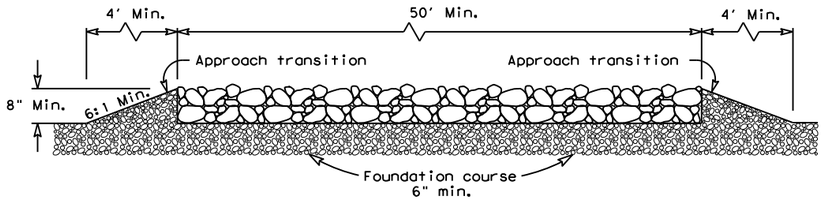
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

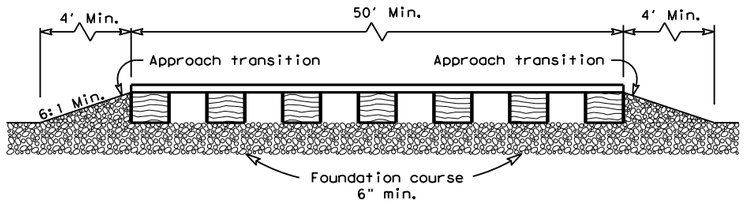
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

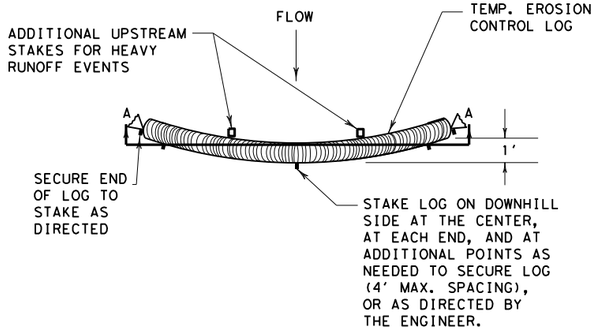
Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

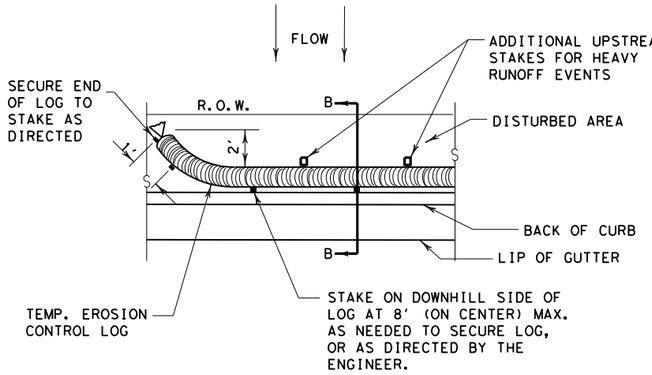
CONSTRUCTION EXITS

EC(3)-16

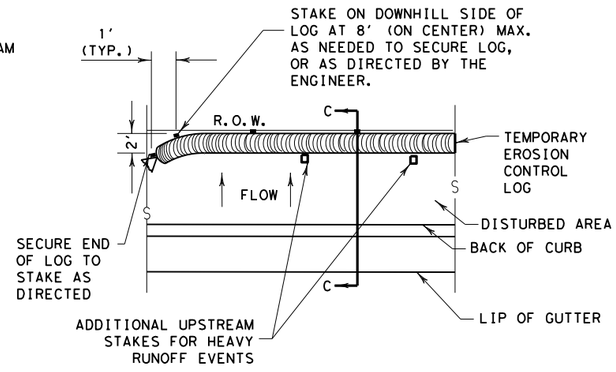
FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	3427	03	007	FM 3356
	DIST	COUNTY		SHEET NO.
	DAL	DAL		120



PLAN VIEW



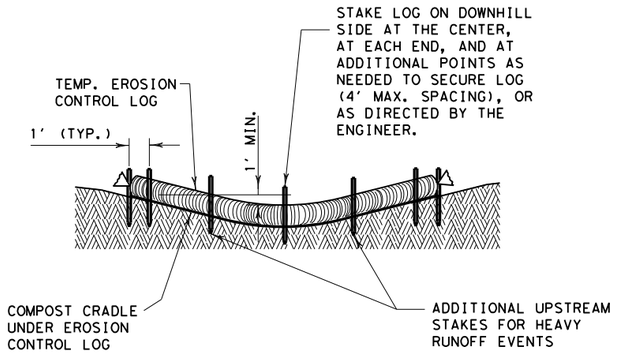
PLAN VIEW



PLAN VIEW

GENERAL NOTES:

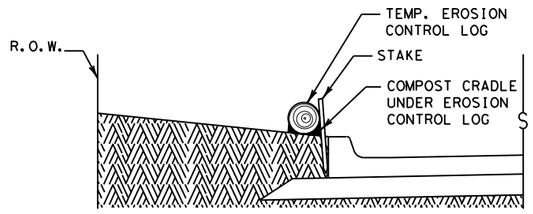
1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.



SECTION A-A

EROSION CONTROL LOG DAM

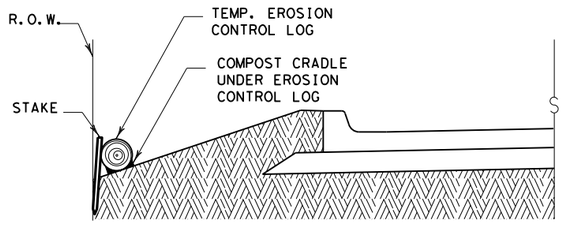
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

CL-BOC



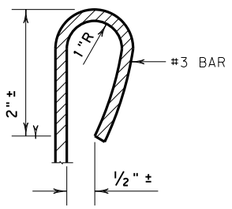
SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

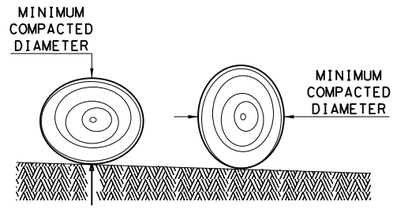
CL-ROW

LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET



REBAR STAKE DETAIL



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM		DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	3427	03	007		FM 3356		
	DIST		COUNTY				SHEET NO.
	DAL		COLLIN				121

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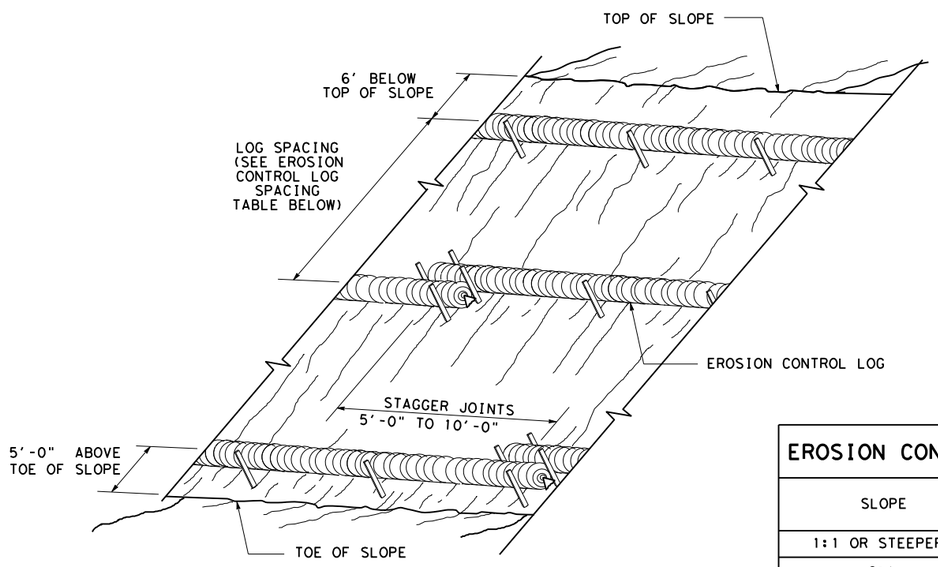
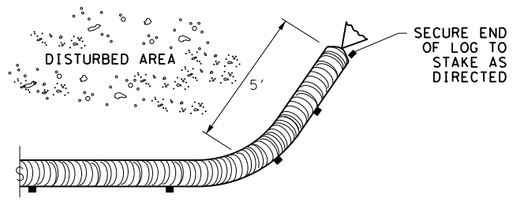


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

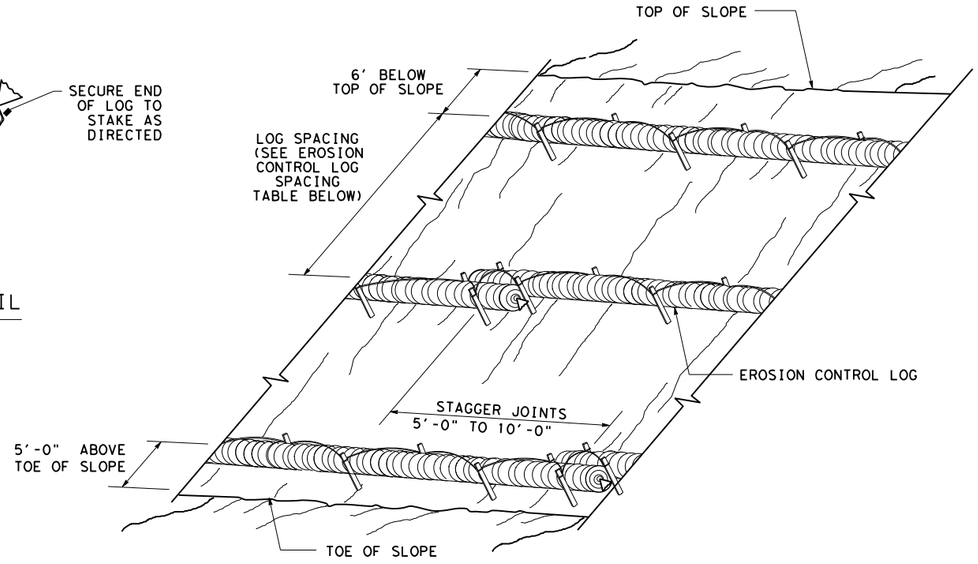
CL-SST



END SECTION RAP DETAIL

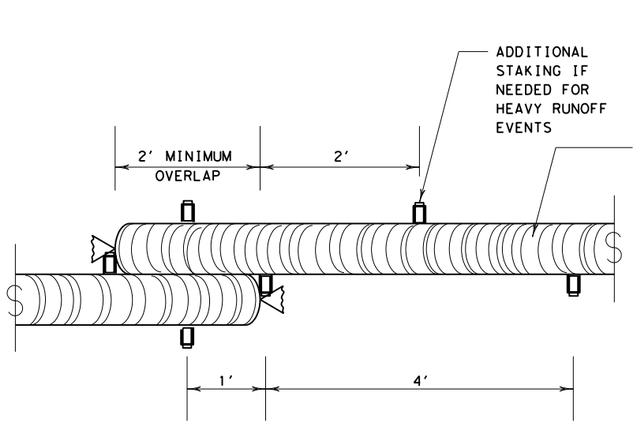
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

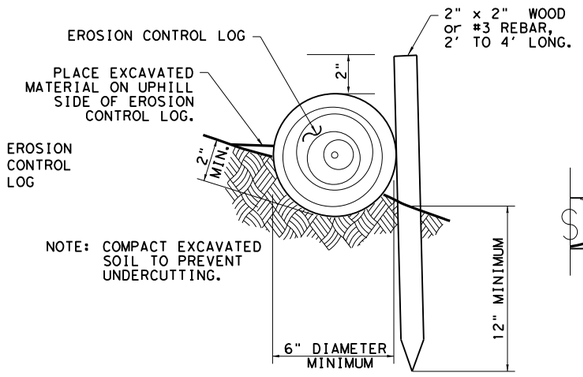
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

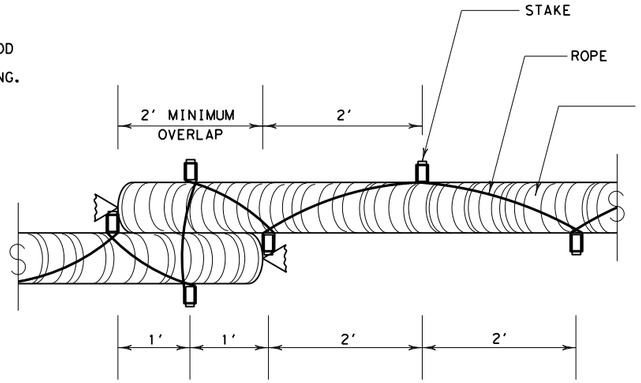


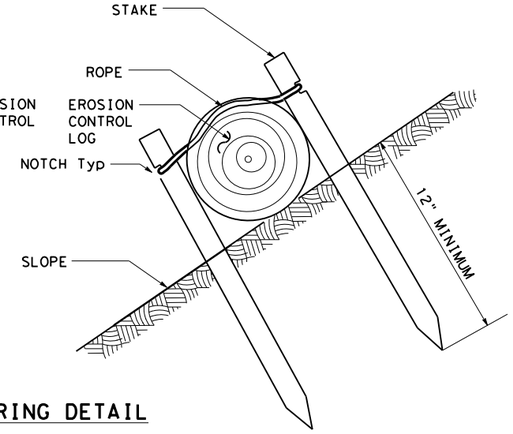


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

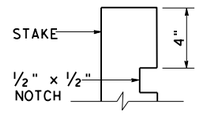
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

FILE: ec116	DN: TxDOT		CK: KM		DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	3427	03	007		FM 3356	
	DIST	COUNTY			SHEET NO.	
	DAL	COLLIN			122	

DATE: $DATE$
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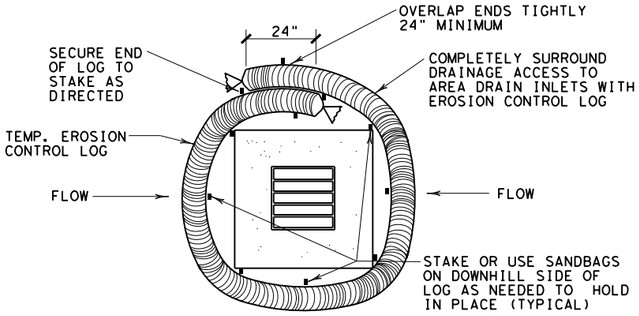
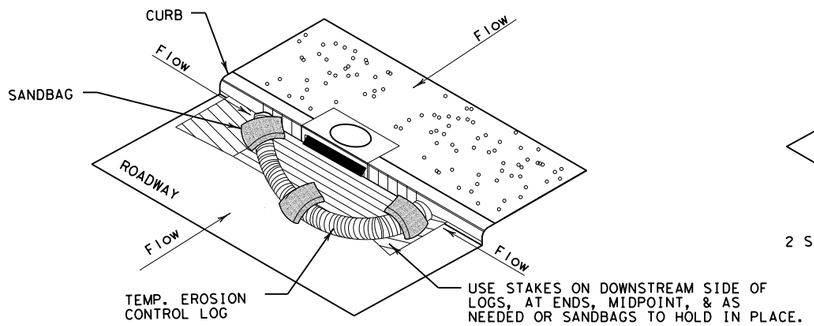


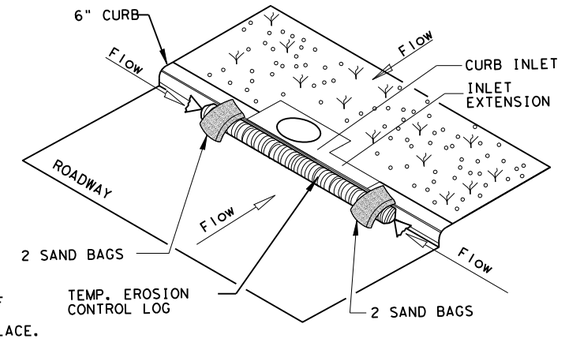
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

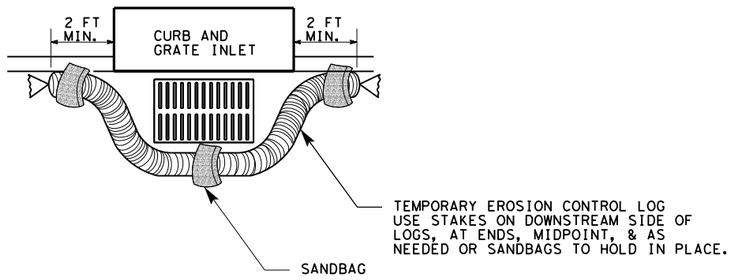
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

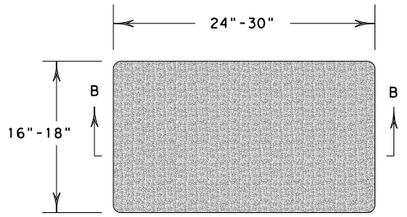
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM	DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	3427	03	007		FM 3356	
	DIST	COUNTY				SHEET NO.
	DAL	COLLIN				123

DATE: $DATE$
FILE: $FILE$

USER ID

SURFACE PREPARATION ITEM 160* TOPSOIL SY / ITEM 161* COMPOST MANUF. TOPSOIL (BOS) (4") SY

SURFACE PREPARATION

Prepare planting area surface BEFORE placing Topsoil, Compost, Fertilizer, Seed and/or Sod.
Once project area has been completed to final lines, grade and compaction, remove objectionable materials from planting area surface and cultivate existing surface to a depth of 4 inches, unless otherwise specified or directed.

Refer to Items 160 and 161 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.

TOPSOIL NOTES:
1. When Topsoil is specified under Item 160, use suitable material salvaged from the project ROW in accordance with Item 160 specifications, and/or secure additional good material from approved sources.
2. Topsoil shall include only the top 6 inches of its native surface, and be easily cultivated, fertile, erosion-resistant and free of objectionable materials.
3. Topsoil obtained from sites outside of the ROW must come from approved sources and have a pH between 5.5 and 8.5 su.
4. Place Topsoil on pre-cultivated surface, spread to a uniform loose cover at thickness specified, and shape per plans. Water and roll the finished surface with a light roller or other suitable equipment per Item 160.3; do not over-compact.

COMPOST NOTES:
1. When Compost Manufactured Topsoil (4") is specified under Item 161, use compost meeting all requirements of Item 161.2 and Table 1. Provide quality control (QC) documentation and obtain Engineer approval prior to compost delivery.
2. Contractor shall provide tickets/invoices that document material type, quantity and placement for all compost delivered.
3. Additional topsoil may be required to be imported to achieve the compost/topsoil mix ratio. Topsoil must meet Item 160 specifications.

APPLICATION OF COMPOST MANUFACTURED TOPSOIL (4")

AFTER Surface Preparation, uniformly spread a 1-inch layer of compost on-grade with 3 inches topsoil over pre-cultivated planting area. (25% compost and 75% topsoil = 1" compost and 3" topsoil.)
Then mix compost and topsoil together by cultivating the compost into the topsoil (by till or disk) to a 4-inch (4") depth.
Roll the finished surface with a light corrugated drum; do not over-compact.

FERTILIZER ITEM 166* FERTILIZER AC

SOIL ANALYSIS FOR FERTILIZER APPLICATION RATE

Unless otherwise stated in the plans, Contractor shall perform at least one soil analysis on each project before fertilization, and submit results to Engineer with recommended fertilizer rates based on soil analysis.
Engineer may direct sample location(s). Soil analysis may be waived if both compost and sod are used on entire project.

FERTILIZER NOTES:
1. Refer to Item 166 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Apply fertilizer BEFORE seeding, or AFTER placing sod.
3. Use fertilizer containing nitrogen (N), phosphoric acid (P) and potash (K) nutrients, unless otherwise specified. At least 50% of the Nitrogen component shall be a slow-release sulfur-coated urea as described in Item 166.3. Do not apply more than 60 lbs Nitrogen per acre without Engineer concurrence.
4. Deliver fertilizer in bags, clearly labeled to show contents, unless otherwise specified or approved prior to delivery. When non-bagged, loose fertilizer is approved, provide documentation for each load of material delivered, to validate authenticity of the material.
5. Apply fertilizer uniformly, as a dry, granular material, essentially dust-free, and do not mix with water for application as a slurry.
6. When both temporary and permanent seeding are specified for the same area, apply half of the required fertilizer before the temporary seeding operation and the other half before the permanent seeding operation.

SEEDING FOR EROSION CONTROL ITEM 164* DRILL SEEDING AC

RECOMMENDED PLANTING SEASON	PERMANENT RURAL SEED MIX ITEM 164 - DRILL SEEDING (PERM) (RURAL)(CLAY)	Pure Live Seed Rate**	PERMANENT URBAN SEED MIX ITEM 164 - DRILL SEEDING (PERM) (URBAN)(CLAY)	Pure Live Seed Rate**	TEMPORARY DRILL SEED MIX ITEM 164 - DRILL SEEDING (TEMP) (WARM OR COOL)	Pure Live Seed Rate**
WARM SEASON Mar.15th, April, May, June, July, August, Sept. 15th	Green Sprangletop (Van Horn)	- 1.0 lbs/AC	Green Sprangletop (Leptochloa dubia)	- 0.3 lbs/AC	Foxtail Millet (Setaria italica)	- 34 lbs/AC
	Sideoats Grama (Haskell)	- 1.0 lbs/AC	Sideoats Grama (El Reno)(Bouteloua curtipendula)	- 3.6 lbs/AC		
	Texas Grama (Atascosa)	- 1.0 lbs/AC	Buffalograss (Texoka)(Buchloe dactyloides)	- 1.6 lbs/AC		
	Hairy Grama (Chaparral)	- 0.4 lbs/AC	Bermudagrass (Cynodon dactylon)	- 2.4 lbs/AC		
	Shortspike Windmillgrass (Welder)	- 0.2 lbs/AC				
	Little Bluestem (OK Select)	- 0.8 lbs/AC				
	Purple Prairie Clover (Cuero)	- 0.6 lbs/AC				
	Engelmann Daisy (Eldorado)	- 0.75lbs/AC				
	Illinois Bundleflower	- 1.3 lbs/AC				
	Awnless Bushsunflower (Plateau)	- 0.2 lbs/AC				
COOL SEASON Sept 16th, Oct, Nov, Dec, Jan, Feb, Mar 14th					Tall Fescue (Festuca arundinaceae)	- 4.5 lbs/AC
					Western Wheatgrass (Agropyron smithii)	- 5.6 lbs/AC
					Red Winter Wheat (Triticum aestivum)	- 34 lbs/AC
					Cereal Rye	- 34 lbs/AC

SEEDING NOTES:
1. When seeding is specified under Item 164, refer to TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown. Materials and construction shall meet specifications.
2. Conduct seeding upon completion of each applicable construction stage (dependent upon planting season requirements), without compensation for additional move-ins.
3. Place seed AFTER preparing planting area surface. Refer to Surface Preparation detail this sheet, as well as Topsoil Item 160 and Compost Manufactured Topsoil Item 161 when specified. Apply fertilizer per Item 166 BEFORE seeding, per specifications and this sheet, to help drill the fertilizer into the soil.
4. When temporary grasses are well-established and more than 2 inches tall, mow planting area before seeding permanent grasses; mowing for this purpose will be subsidiary. When vegetation is not already well-established, cultivate planting area to a depth as described in Item 164.3, before temporary seeding and before permanent seeding.
5. Seed material must be appropriate to the location, soil type and season. Use the seed mix species and pure live seed rates designated in Tables 1-4 of the TxDOT 2014 Standard Specifications* for Item 164, unless otherwise specified.
6. All seed shall meet labeling, delivery, analysis, and testing requirements described in Item 164.2.1. Deliver seed in labeled, unopened bags or containers to Engineer prior to planting.
7. Uniformly plant seed over the designated planting area, along the contour of slopes, and drill seed to a depth as described in Item 164.3.4.
8. Hydroseeding may be allowed, when specified or Engineer concurs.
9. Implement and continue Vegetative Watering per the schedule, rate and volume specified under Item 168.

TXDOT REFERENCE MATERIALS:
- * "STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES" 2014
- "A GUIDANCE TO ROADSIDE VEGETATION ESTABLISHMENT" 2004
- ONLINE TRAINING COURSE: MNT415 REVEGETATION DURING CONSTRUCTION
- DALLAS DISTRICT "VEGETATION ESTABLISHMENT GUIDELINES"

SODDING FOR EROSION CONTROL ITEM 162* BLOCK SOD (BERMUDA) SY

BLOCK OR ROLL SOD	COMMON NAME	BOTANICAL NAME
	Common Bermuda Grass	Cynodon dactylon

SODDING NOTES:
1. Refer to Item 162 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Place sod between the average date of the last freeze in the Spring and 6 weeks before the average date of the first freeze in the Fall, per the Texas Almanac for the project area.
3. Place sod only AFTER soil surface preparation is complete as detailed in this sheet. Dry soil may require pre-watering.
4. Place all sod (blocks or rolls) within 24 hours of delivery to the site, and keep moist from the time it is dug up until it is planted. Sod with dried roots will not be accepted.
5. Place sod with joints alternating on each row to prevent all joints from lining up, and place blocks firmly against adjacent blocks. Roll, tamp and trim sod per Item 162.3.
6. Place fertilizer promptly AFTER sodding operation is complete in each area.
7. Water sod immediately following placement, and continue Vegetative Watering per Item 168.

VEGETATIVE WATERING FOR ESTABLISHING SEED AND SOD ITEM 168* VEGETATIVE WATERING MG

WATERING SCHEDULE

SEASON (Usual Months)	RATE	TIME SCHEDULE	TOTAL WATER ESTIMATE
SPRING & FALL (March, April, May, October)	7,000 gallons/acre per working day	Vegetative watering for seed shall begin on the day after rainfall described below and continue for 60 consecutive working days; vegetative watering for sod shall begin on the day the sod is placed and continue for a minimum of 15 consecutive working days.	420,000 gallons/acre (60 working days)
SUMMER (June, July, August, September)	12,000 gallons/acre per working day		720,000 gallons/acre (60 working days)
WINTER (November through February)	1,000 gallons/acre per working day	Vegetative watering for seed and/or sod shall begin on the day after placement for 15 consecutive working days	15,000 gallons/acre (15 working days)

Notes: Rate and frequency may be adjusted, with the approval of the Engineer, to meet site conditions (especially with sod).
For informational purposes only: 1,000 gallons equals 1 MG

VEGETATIVE WATERING NOTES:
1. Refer to Item 168 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Use clean water free of industrial waste and other substances harmful to vegetation growth, per Item 168.2.
3. Use Vegetative Watering to keep the seed bed moist during germination; not to provide initial watering. After drill seeding, postpone watering operations until site receives at least 1/2-inch of natural rainfall in a single day. Delay watering operations for warm season grasses until soil temperature exceeds 70 degrees F.
4. For sod, water immediately.
5. All water distribution equipment shall be furnished and operated to provide water at a uniform and controllable rate. Use a metering device on all watering equipment.
6. Evenly distribute water over entire area designated for seeding and/or sodding, using even spray patterns that do not disturb seed bed and/or dislodge seed from seed bed.
7. Do not water between the hours of 12:00 p.m. and 6:00 p.m. when daytime temperatures exceed 95 degrees F.
8. After initial establishment period, continue intermittent watering of newly established seed or sod at a rate of approximately 1-inch water/week, during summer months until end of contract.
9. If 1/4-inch or more of rainfall occurs on site on any given working day, no vegetative watering will be needed on that working day. (Note: 1/4-inch rain equals 7,000 gallons of water per acre.)
10. Should the Contractor fail to apply the specified amount of water within the time allowed, any seed or sod in poor condition shall be replaced, fertilized, and watered at Contractor's expense.

**Note: The amount of Pure Live Seed (PLS) in one pound of bulk seed is based on three factors: % Purity, % Germination, and % Dormant. Use the following formula to calculate PLS in bulk seed: PLS = % Purity X (% Germination + % Dormant) Ensure that the specified amount of pure live seed is placed.

ROADSIDE MOWING ITEM 730* PROJECT MAINTENANCE AC

MOWING NOTES:
1. During project construction, once seed is established, use mowing to promote permanent grasses by mowing any remaining temporary grasses.
2. Also mow established turf and ROW grasses in designated areas of project limits as specified or directed by Engineer.
3. Remove litter and debris prior to mowing.
4. Do not mow on wet ground when soil rutting can occur.
5. Hand-trim around obstructions and stormwater control devices as needed.
6. Maintain paved surfaces free of tracked soils and clipped vegetation.

SEQUENCE OF WORK:
- CULTIVATE SURFACE SOIL.
- PREPARE / PLACE TOPSOIL, OR
- PREPARE / PLACE COMPOST MANUFACTURED TOPSOIL.
- APPLY FERTILIZER AND THEN PLACE SEEDING, OR
- PLACE SOD AND THEN APPLY FERTILIZER.
- CONDUCT VEGETATIVE WATERING.
- CONDUCT ROADSIDE MOWING, AS DIRECTED.

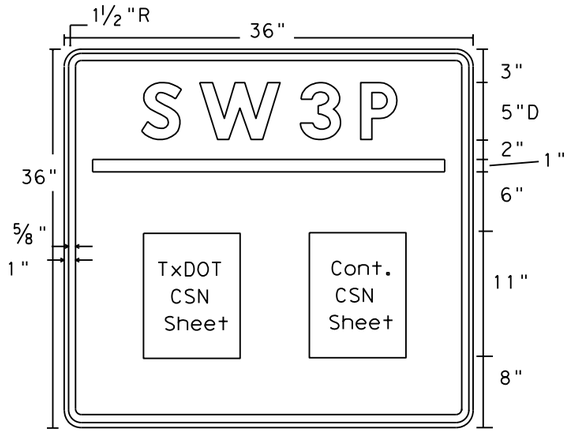
Texas Department of Transportation

VEGETATION ESTABLISHMENT SHEET
(DALLAS DISTRICT)

TEMPLATE REVISION DATE: 02/21/19

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CPB	6	(See Title Sheet)		FM 3356
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
XXX	TEXAS	DALLAS	COLLIN	
CHECK	CONTROL	SECTION	JOB	124
XXX	3427	03	007	
CHECK				
XXX				

DATE



SW3P SIGN

TxDOT & Contractor Construction Site Note (CSN)

Sign Dimensions

36" X 36"

Letters - White
Numbers - White
Border - White
Background - Blue

GENERAL NOTES:

1. The alphabets and lateral spacing between letters and numerals shall conform with the "Texas Manual on Uniform Traffic Control Devices for Streets and Highways", (TMUTCD) latest edition, and the "Compliant Work Zone Traffic Control Devices List". Lateral spacing of text shall provide a balanced appearance. All materials shall conform to Department Specifications.
2. Legend and border may be applied by reverse screening process with transparent colored ink, cut-out white reflective sheeting applied to colored background or combination thereof. Background shall be reflective sheeting Type C.
3. CSN Sheets will be laminated and attached to the sign with an adhesive. Ensure sheets remain dry. (See Figure 1).
4. SW3P Signs should be placed just inside the ROW line at the project limits at a readable height. It may be placed perpendicular or parallel to ROW line. If the sign cannot be placed outside the clear zone, it will be mounted per TMUTCD requirements.
5. Final location of the signs will be as approved by the Engineer.

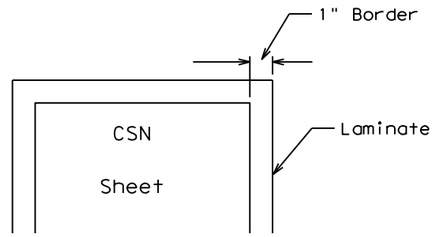
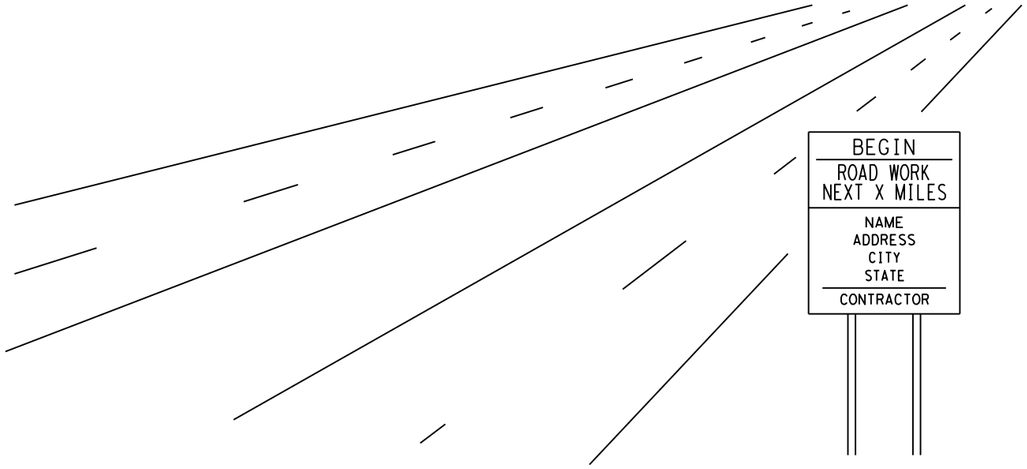
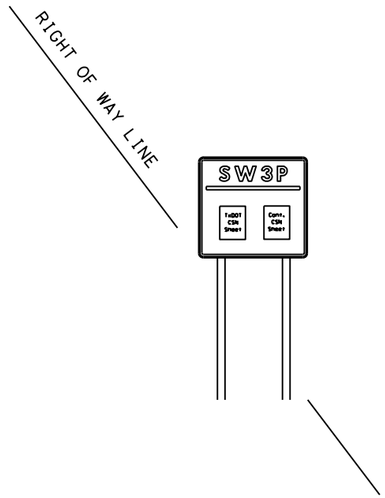


Figure 1





DEPARTMENT MATERIAL SPECIFICATIONS	
PLYWOOD SIGN BLANKS	DMS-7100
FLAT SURFACE REFLECTIVE SHEETING	DMS-8300
VINYL NON-REFLECTIVE DECAL SHEETING	DMS-8320

COLOR	USAGE	REFLECTIVE SHEETING OR OTHER MATERIAL
BLUE	BACKGROUND	TYPE C (FLUORESCENT PRISMATIC)
WHITE	LEGEND & BORDERS	VINYL NON-REFLECTIVE DECAL SHEETING

Texas Department of Transportation
DALLAS DISTRICT STANDARD

SW3P SIGN SHEET

FILE:	DN: IxDOT	CK:	DW:	CK:	
©TxDOT 2016	DISTRICT	PROJECT			SHEET
REVISION DATE: 10-16-15	18	SEE TITLE SHEET			125
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	COLLIN		3427	03	007	FM 3356

LEVELS DISPLAYED
PATH: